

MODERN PLASTICS

DECEMBER 1955

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Big Savings and Profits with PLASTICS PATCHES—Page 98

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MODERN PLASTICS*

December 1955 • Vol. 33, No. 4

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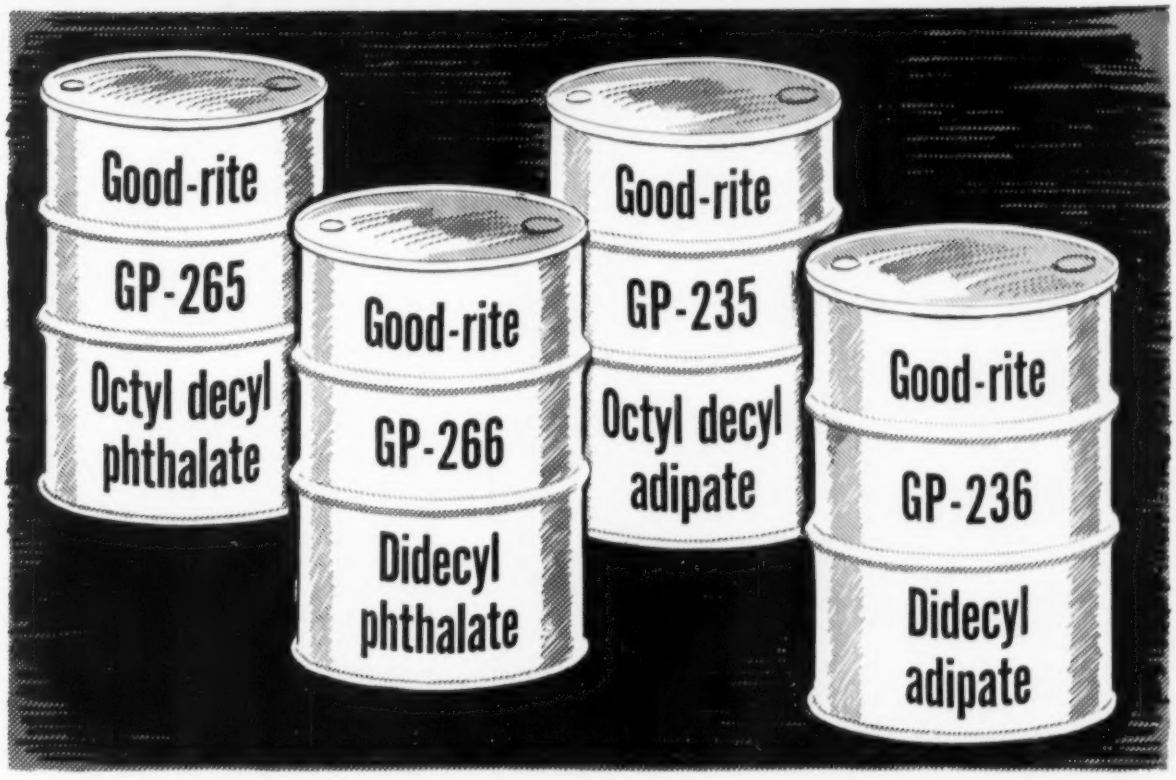
Modern Plastics Executive and Editorial Offices: 575 Madison Ave., New York 22, N. Y.

Modern Plastics, published monthly by Breskin Publications, Inc., at Emmett St., Bristol, Conn. Modern Plastics Encyclopedia Issue published as second issue in September by Plastics Catalogue Corp., at Emmett St., Bristol, Conn. Second-class mail privileges authorized at Bristol, Conn. Modern Plastics copyright 1955 by Breskin Publications, Inc. All rights reserved. Nothing that appears in Modern Plastics may be reprinted wholly or in part without first securing special permission. Modern Plastics is regularly indexed in Industrial Arts Index and Industex. Subscription rates: U.S., its possessions, and Canada, $6.00 for one year, $11.00 for two years, $15.00 for three years; Pan-American countries, $10.00 for one year, $17.00 for two years, $24.00 for three years; all other countries $15.00 for one year, $25.00 for two years, $35.00 for three years, payable in U.S. currency. Single copies (except the September Encyclopedia Issue, which is not sold separately) $0.75 each in the United States, its possessions, and Canada; all other countries, $1.50. Printed in the U.S.A., by Hildreth Press, Inc., Bristol, Conn.

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EDITORIAL

Confusion Compounded

As more material makers move into polyethylene production, as more and more processors take on polyethylene resins, and as more industrial end users begin to specify polyethylene product components, the establishment of simple, sound, and easily understood nomenclature to differentiate between the various kinds of polyethylene becomes a vital need.

In the lead article in the September 1955 issue of MODERN PLASTICS Magazine, it was pointed out that there are two quite different methods of polymerizing ethylene by catalyst or low-pressure systems. And it has long been recognized that the high-pressure methods used by different companies are not all completely similar. Furthermore, since there is a distinct probability that alloys or blends of different kinds of polyethylene will be used to obtain specific properties, and since the industrial end user cares not at all how the material was made, it would seem that definitions and terms based on the method of manufacture are worse than useless.

Throwing out the terms "high-pressure" and "low-pressure," we come to the matter of definitions based on properties.

One faction in the industry prefers to use "modulus" as the basis of definition; another prefers "density;" another "molecular weight;" another "linearity;" and still another "heat resistance."

Since modulus means stiffness of the molded or extruded material and since blending will produce any number of variations in modulus, nomenclature based on that term would not be too significant.

Since molecular weight is strictly a chemical term relating to a relationship between structure and hardness, its use would appear to serve no proper purpose at end user level.

Linearity refers to the arrangement of molecules in the material and is likewise a term best known to chemists. It has little meaning to engineers, designers, or purchasing agents.

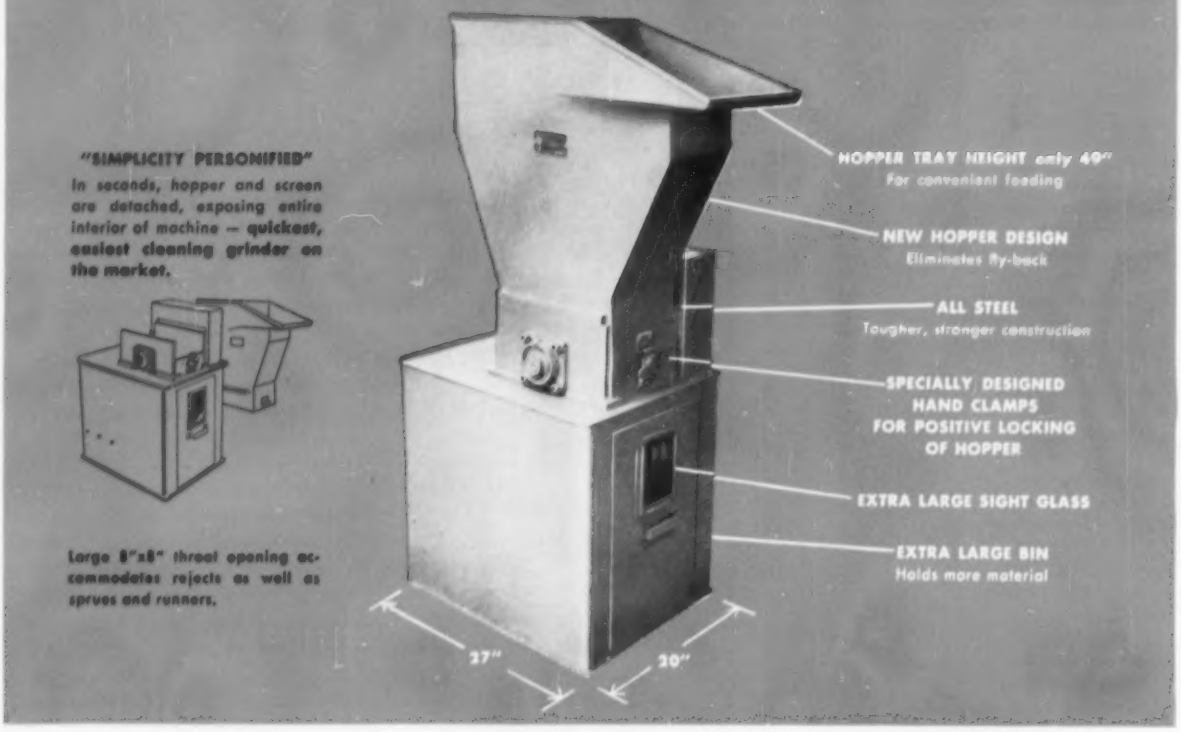
Heat resistance could be a very valid basis of differentiating between one type of polyethylene and another, but heat resistance is only one property desired in a material.

It would seem, therefore, that density, being an easily understood term and embracing by inference both molecular weight and linearity, might be the soundest term upon which to base a simple nomenclature for differentiating between the polyethylenes.

Particularly at this point in the progress of the polyethylenes, when they are of such tremendous interest to all industry and to the public, it is important that some set of terms be agreed upon by all material makers involved. And that these be publicized to the point where their use will become habit. As matters stand today, confusion in this important area is being compounded daily in conversation as well as in the literature.

We suggest that within the framework of one of the industry's associations a committee might be established to solve this problem at an early date. And MODERN PLASTICS Magazine will be happy to receive correspondence from readers in support of the different terms now in confused use or in support of an entirely different approach to the problem of definition.

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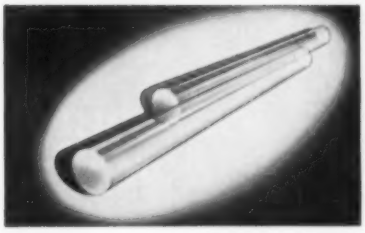
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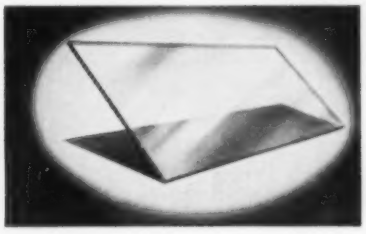
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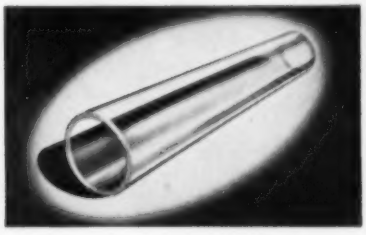
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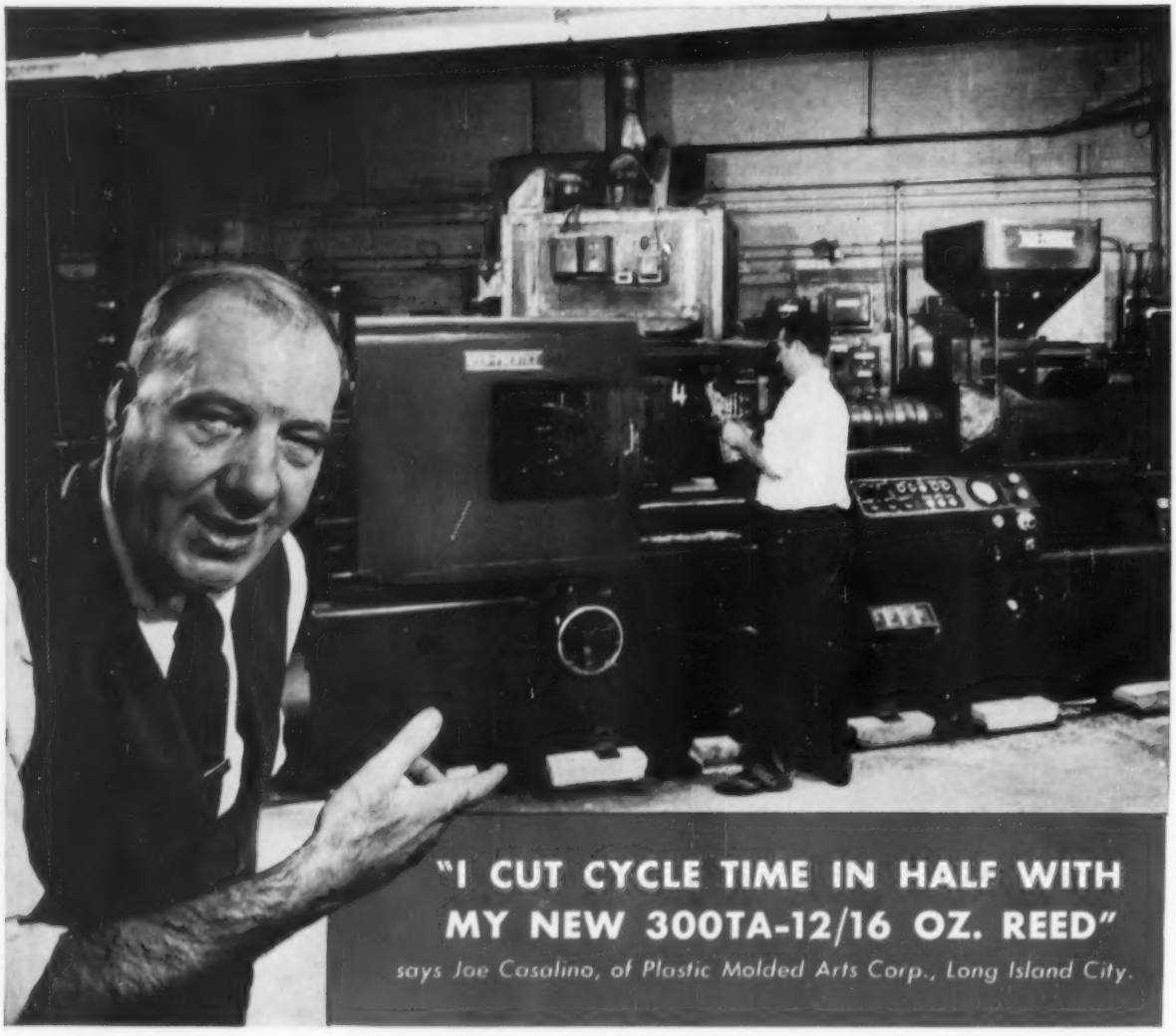
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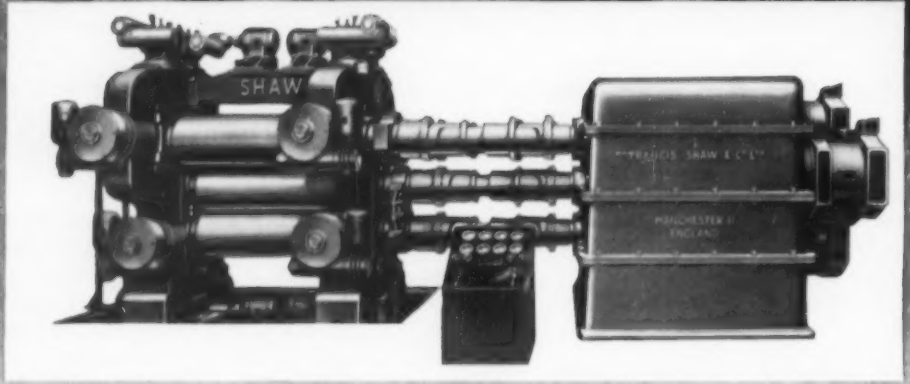
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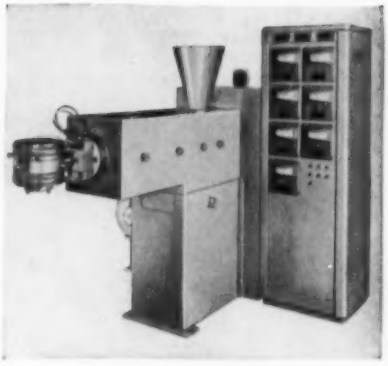


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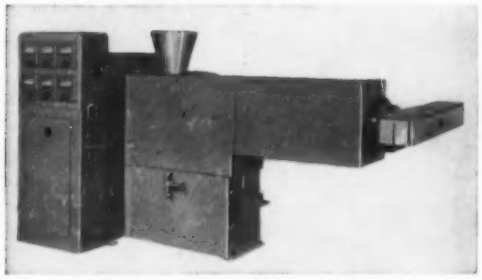
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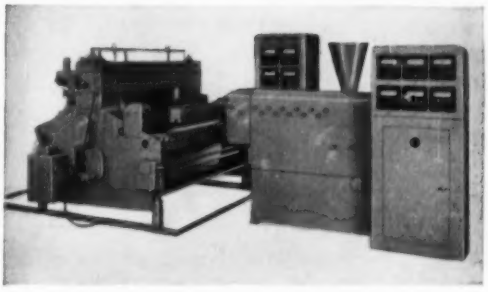
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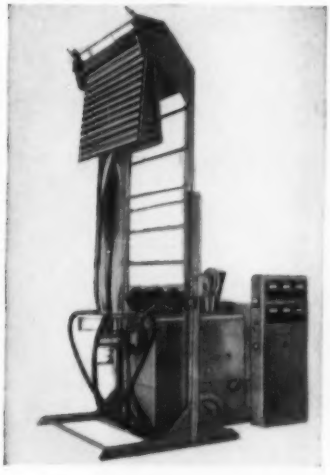
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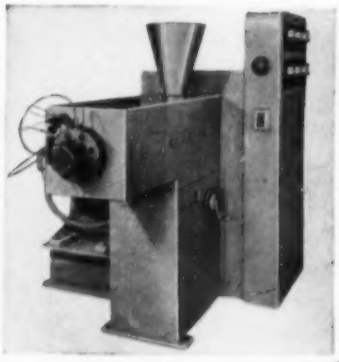


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PLIOVIC EDB90V is the straight polyvinyl chloride resin that permits the benefits of dry blending to be realized in the extrusion of wire covering. It is an electrical grade resin—fully approved by Underwriters' Laboratories as interchangeable with all other electrical grade resins. And it's a dry blending resin.

Careful control of its particle size, shape and distribution permits PLIOVIC EDB90V to form sandy, free-flowing mixes that do not pack or bridge. These compounds also process readily on any type of forming equipment to give end products having excellent physical properties.

Full details on how to cut wire covering costs with dry blending PLIOVIC EDB90V plus information on the other cost-cutting members of the PLIOVIC family are yours by writing to:

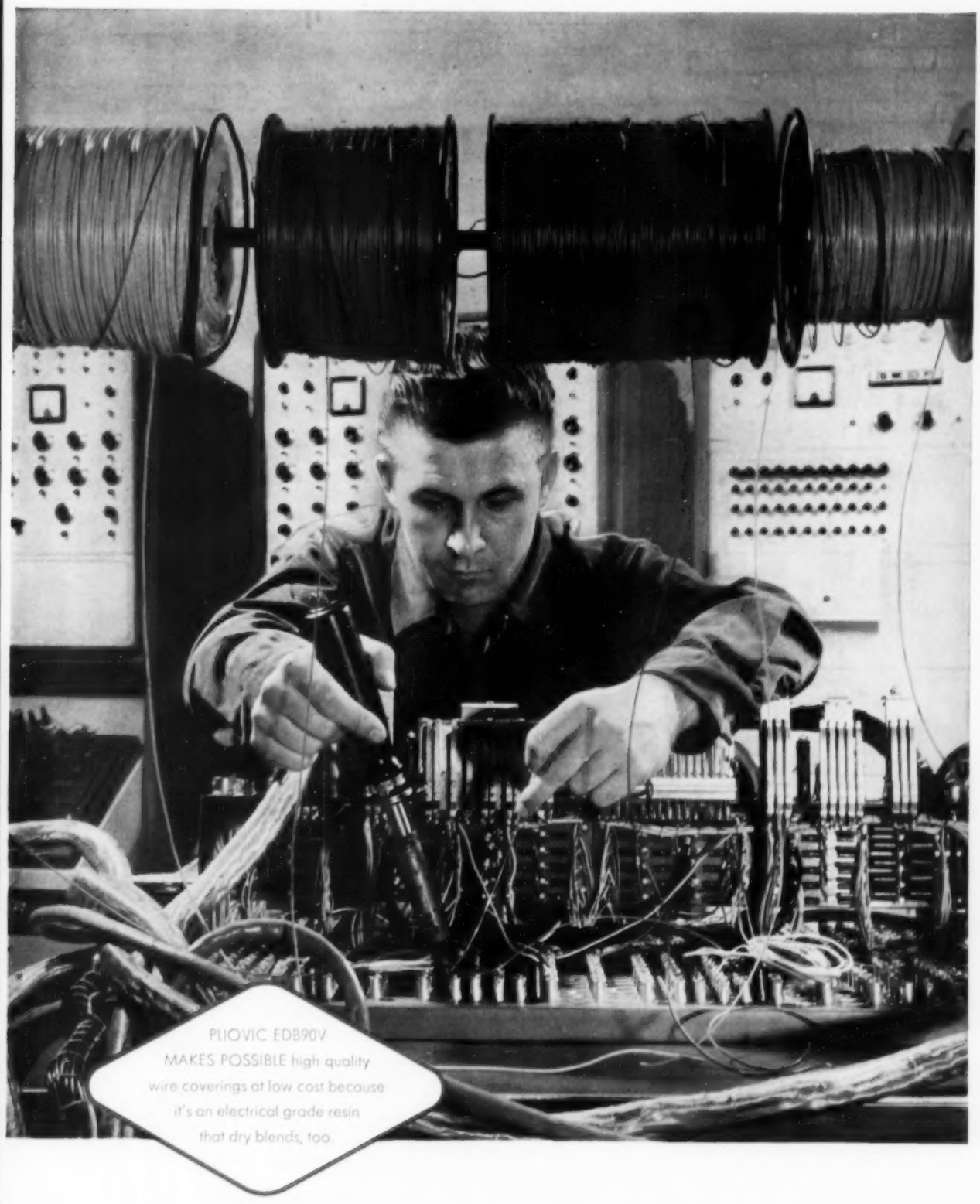
Goodyear, Chemical Division, Akron 16, Ohio

CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Plioflex, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

The Finest Chemicals for Industry—CHEMIGUM • PLIOBOND • PLIOFLEX • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS

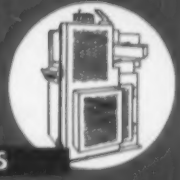
PLIOVIC...another quality product of Goodyear Chemical Division



In Plastics Reducing Machinery, Look to CUMBERLAND for the COMPLETE LINE



GRANULATORS



DICERS



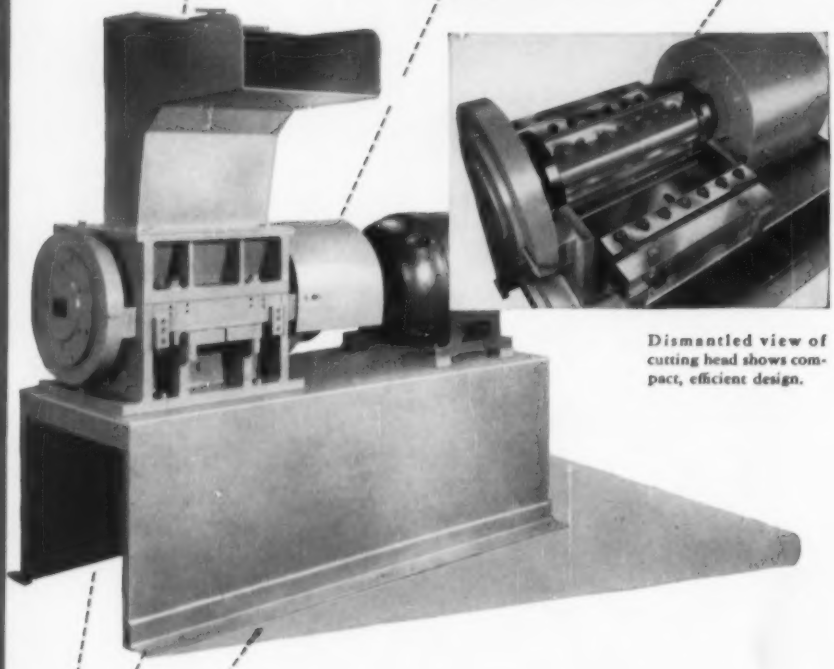
CHOPPERS



PREBREAKERS

MODEL 20 All Steel Granulator

CUSTOM ENGINEERED
QUALITY BUILT



Dismantled view of cutting head shows compact, efficient design.

1 HEAVY DUTY — Large flywheel—thick all-steel weldments—deep welds—parts are of flawless wrought steel (not steel castings)—machine resists wreckage.

2 LARGE THROAT OPENING — 8 by 20" size.

3 PRIOR BANDSAWING NOT NEEDED — Machine specially built to handle large chunky parts such as bleeder scrap, cylinder purgings and heavy cast slabs of polystyrene, modified polystyrene and acrylic resins.

CUMBERLAND Engineering Company Inc

BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY

PROVIDENCE · RHODE ISLAND

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
4113 West Jefferson Blvd., Los Angeles 16, Cal.

Woodman, Spare that tree-

There's More Money in K-K Molded Plastic Frames





Up to now, most screen frames were made of wood—probably just because they always have been. And they got dirty, splintered, and warped—spoiling work and profits both.

So Tipp Supply Company of Tipp City, Ohio, asked if we could produce them in plastics. Result: a flat, strong, adjustable phenolic frame with amazing life; that's solvent- and ink-resistant; with molded-in grooves that won't splinter or spread. And, although the speed-hungry printers find that it gives greater accuracy and higher output, it's competitively priced. Orders are pouring in like homing pigeons.

So maybe *you* don't make silk screen frames. Do you have products or parts that might be better and cheaper in plastics? CAN YOU BE SURE TILL YOU'VE TALKED TO A CUSTOM MOLDER?

We've been giving the right answers to American industry for years. Call us and be *sure*.

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BRANCH SALES OFFICES: New York, *Mt. Vernon MO 4-4866* Rochester, *Hillside 0626* • Chicago, *Merrimac 7-1830* • Detroit, *Jordan 6-0743* • Philadelphia, *Hilltop 6-6472* • Dallas, *Logan 5234* • San Gabreil *Atlantic 7-9633* • St. Louis, *Parkview 5-9577* • Atlanta, *Exchange 5516* • Toronto, *Riverdale 3511.*

Dake Plastics Presses Are

Job Engineered...

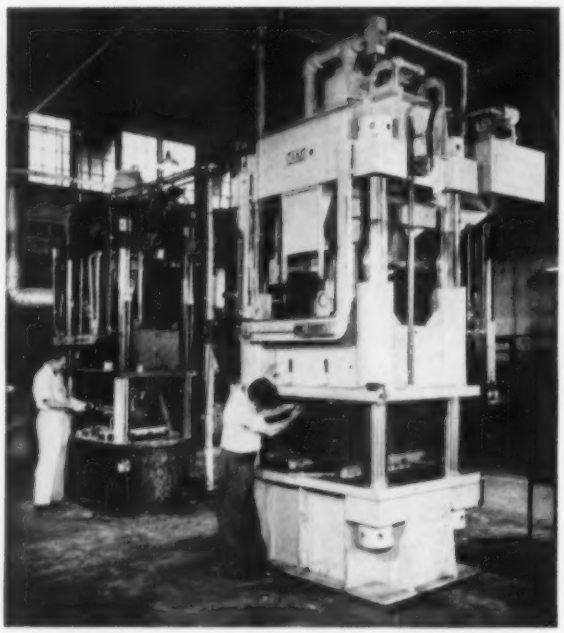
for

BETTER QUALITY
FASTER PRODUCTION
LOWER COSTS

DAKE PRESSES for Molding Reinforced Plastics are job engineered to assure more efficient production . . . the key to more profitable production in this rapidly expanding industry. Dake enables you to meet the exacting requirements of modern molding techniques for highest product quality at lower cost.

Advance and closing speeds, pressure, temperature, and curing time are engineered to meet individual job specifications. Dake Presses are semi-automatic for accurate control throughout the entire curing cycle, and rigidly constructed to hold precise dimensions day after day, month after month.

To assure higher production schedules and consistent quality, let Dake design a *job engineered* press for your individual requirements. Write today for Bulletin 340, and tell us of your particular problems.



These are two of three Dake Plastics Molding Presses built for a large refrigerator manufacturer. The newest (right) incorporates features that were not considered necessary when the first press was built only 30 months earlier. Thus Dake engineering copes with the rapid advances now being made in the plastics molding industry.

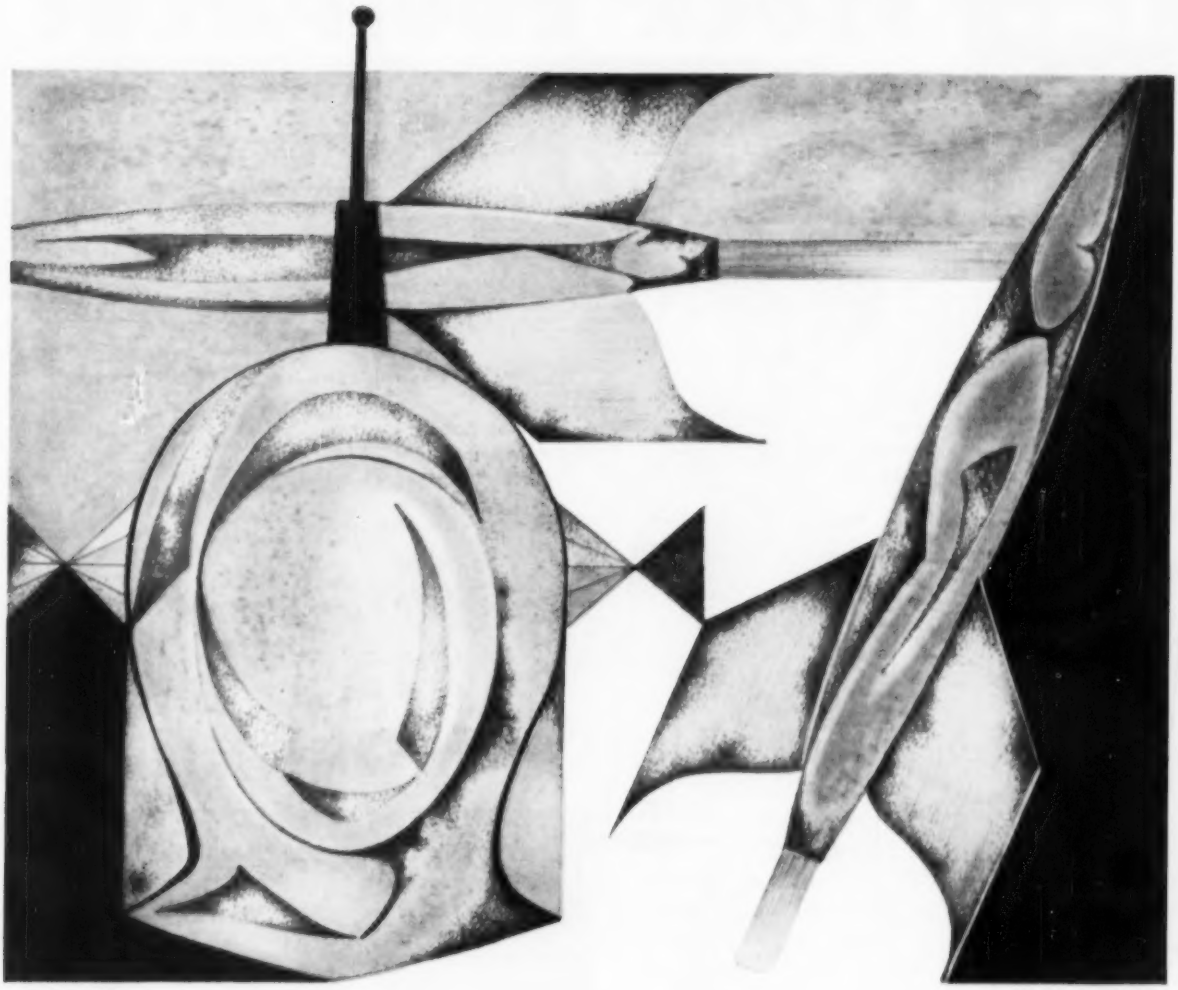
DAKE CORPORATION, 648 Seventh St., Grand Haven, Mich.

DAKE PRESSES



Arbor Presses | Hand-Operated Hydraulic | Power-Operated Hydraulic | Guided Platen | Gap Type Presses | Movable Frame

Why does man use color



DECORATION FOR PLASTIC TOYS

In performing their decorative function, colors — pigments — are attractive, set a mood. Plastic toy manufacturers delight children by incorporating pigments into the resins which they mold into exciting playthings.

Acheson supplies plastics fabricators with predispersed color for easy handling, greater tinting strength and streak elimination. There is an art to proper dispersion which Acheson has mastered in 50 years of operation. May we put this skill to work for you.

Acheson Dispersed Pigments Co., 2250 E. Ontario St., Philadelphia 34, Pa.
West Coast Distributor: The B. E. Dougherty Co., Los Angeles 21, Calif.
In Europe: Acheson Colloids Limited, Slough, England

ACHESON DISPERSED PIGMENTS CO.

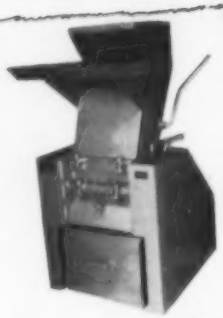
a unit of Acheson Industries, Inc.

DISPERSIONS FOR THE PLASTICS AND PRINTING INK INDUSTRIES

IMS STOCK EQUIPMENT



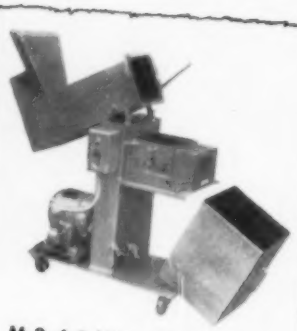
M-400 Two-Stage Big Part Grinder. Fastest Granulator Ever Made.
Complete ... $2975.00



M-40 11" x 17" Throat Heavy Duty, Single Stage Scrap Part Grinder.
Complete $1795.00



M-4 5⅜" x 8½" Throat All-Purpose Grinder
Complete . . $768.50



M-3 6-1/2" x 7" Throat Lowest Cost Sprue and Parts Grinder
Complete, only ... $548.50



Low Cost Injection Mold Circulator.
Complete ... $369.50

for the Modern

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6" Gate Cutters
Each $3.65



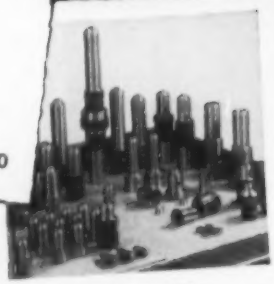
Mold Clamp Sets
Per Set of 8 ... $55.15



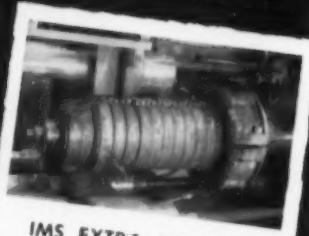
Silicone Spray Mold Release
Per Doz. (Postpaid)
..... $18.00

Remember

Injection Molders Supply Co. specializes on replacement nozzles and heating cylinders for all types of injection machines.



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For All Injection Machines



IMS EXTRA CAPACITY HEATING CYLINDERS
Stock Models for Reed-Prentice Machines
Others to Order.
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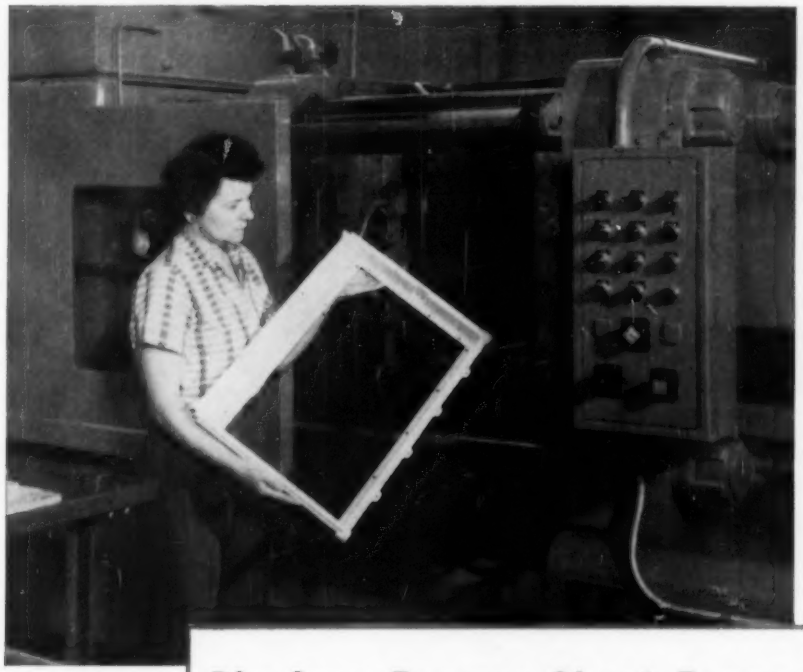
IMS DRUM TUMBLERS

150 lb.	3/4 HP Model T-2	$498.50
300 lb.	2 HP Model T-2B	785.00
400 lb.	3 HP Model T-2C	1185.00

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FULL CAPACITY PARTS on H-P-M 20/28 oz.

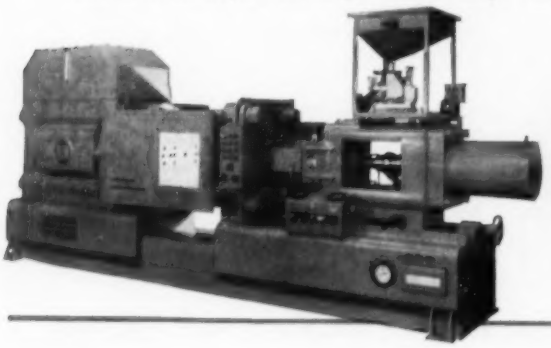


Big Area Freezer Chest Frame Molded With Ease

Minnesota Plastics Corp. reports, "Our experience with our new H-P-M 20 oz. injection machine has been very satisfactory. The construction of the machine makes for better operation and the machine seems adequate to handle parts up to its rated capacity with little or no difficulty."

You get full capacity value with the H-P-M 20/28 oz. . . . parts like these normally require 32 to 48 oz. machines to obtain sufficient plasticizing capacity and mold areas to accommodate big area parts. That's why the H-P-M 20/28 oz. is your best buy. The heating chamber is larger than those found on machines twice its size . . . injection speed far exceeds anything yet built . . . there's plenty of daylight and stroke for deep parts . . . and large platens to accommodate big molds.

The parts illustrated weigh 19.4 ozs. and have a projected area of 170 sq. in. — a difficult rectangular shape to mold. If you are molding similar parts in the 16 to 28 oz. class, you can't overlook the production advantages of this new H-P-M, Model 400-H-20/28. Write for details, today.



HPM

THE HYDRAULIC PRESS MFG. CO.

1010 Marion Road, Mount Gilead, Ohio, U. S. A.

Presses for Every Pressure Processing Application

VINYL foam is here!

ELASTOMER PROCESS
VF
VINYLFOAM

Now they're together! Two words that are sales magic: Vinyl and foam! Vinylfoam!

VINYL foam is a practical reality, now in volume production!

VINYL foam is the ideal foam for electronic heat sealing!

VINYL foam is the heat-sealing foam, seals perfectly to vinyl film, cottons, rayons, most synthetic materials, and natural textiles.

VINYL foam is the heat-sealing foam for upholstered furniture and automotive inserts.

VINYL foam is the heat-sealing foam for deep embossed effects.

VINYL foam is the fire-resistant foam for contoured cushions, cored or uncored, for public transportation seating.



VINYL foam – for bags, for belts

Besides improving the design, feel and attractiveness of handbags, Vinylfoam is improving the saleability of molded items, including apparel inserts, apparel interlinings, mats, brushes, slippers, gloves, belts, toys, flexible covers, cleaning sponges, strap pads, wall coverings and many other articles.

A MAJOR SUPPLIER of yours is likely to be a Vinylfoam licensee and will be pleased to consult with you regarding YOUR SPECIFIC REQUIREMENTS. Among our licensees are:

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Brown Rubber Company	Lafayette, Ind.
Cambridge Rubber Company	Taneytown, Md.
L. E. Carpenter & Company	Wharton, N. J.
Dunlop Tire & Rubber Corp.	Buffalo, N. Y.
Federal Leather Company	Belleville, N. J.
Firestone Tire & Rubber Company	Akron, O.
General Tire & Rubber Co.	Lawrence, Mass.
B. F. Goodrich Company	Shelton, Conn.
Goodyear Tire & Rubber Company	Akron, O.
Great American Industries	Bedford, Va.
Hood Sponge Rubber Company	Chicago, Ill.
Kyfoam Incorporated	Louisville, Ky.
Nopco Chemical Co.	Harrison, N. J.
Seiberling Rubber Company	Akron, O.
Sheller Manufacturing Company	Keokuk, Ia.
Sun Rubber Company	Barberton, O.
U.S. Rubber Company	Mishawaka, Ind.

U.S. EXPERIMENTAL LICENSEES

Bakelite Company	Pittsburgh, Pa.
Firestone Plastics Company	Pottstown, Pa.
B. F. Goodrich Chemical Co.	Cleveland, O.
The Girdler Company	Louisville, Ky.
Monsanto Chemical Company	St. Louis, Mo.

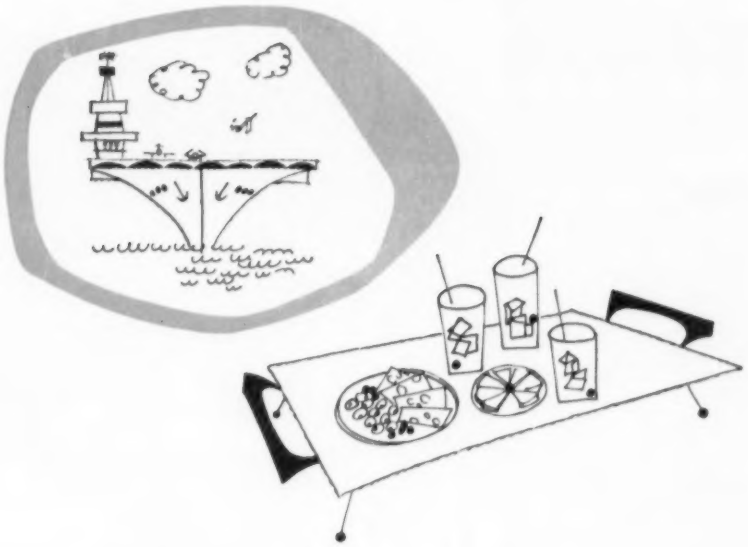
CANADIAN AND OVERSEAS PRODUCTION LICENSEES

British Rubber Company	Montreal, Que.
Dunlop Canada Limited	Toronto, Ont.
H. F. Products, Ltd.	Montreal, Que.
Robinson Moulded Products	Woodbridge, Ont.
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on the go with **Plenco...**

Whether for precision electronic components on mighty aircraft carriers or smooth-to-the-touch tray handles and tough, break-resistant service trays—designers and manufacturers are finding Plenco phenolics one of the important factors in the race for design and durability—at a lower cost.

Plenco's engineering and chemical research has developed a wide range of quality controlled phenolics, and can create specific characteristics to fit specific requirements. The result is more and more users of quality phenolics are turning to Plenco.

If you are a manufacturer or molder—whatever your needs, present or future—it will pay you to investigate Plenco molding compounds and industrial resins!

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

For an ultra fast setting compound...

Plenco #433

A proportion of every molder's jobs lend themselves to the ultra fast setting compound.

Plenco 433 is a general purpose material, and its molded properties are typical of this class.

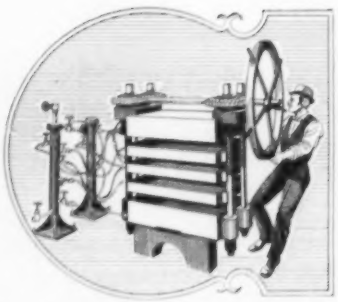
This formulation melts to high plasticity for ease of filling both compression and transfer cavities. What we like about it is that it is not relatively sensitive at this stage. Once the cavities are filled and high pressure applied, polymerizing is extremely rapid.

Plenco 433 is our idea of a modern material having greater pressure-set sensitivity.

It is not tricky; the prescription for less closed press time using Plenco 433 is a good hot preheat and high end molding pressure. Can you supply these conditions? If so, try this compound; it can do a good job for you.

in the good old days

when Grandpa molded on this screw-operated press . . .



when one of the big names in the rubber industry was Goodrich-Tew & Company

ERIE FOUNDRY COMPANY WAS A GREAT NAME IN COMPRESSION PRESSES



in today's plastic shop

Fiberglass is molded on ERIE Presses that anticipate all possible requirements in reinforced plastics molding. This ERIE semi-automatic, self-contained press can be arranged with *three* closing and *two* opening speeds and tonnages. In a five-speed cycle, the ram meters down in high speed from the top of its stroke—stroke length is adjustable too—automatically moves into an intermediate speed and presses at low speed. Pressing speed and pressure apply when the material is contacted. After curing, the ram starts upward at low speed—adjustable from 0 to maximum—with high stripping tonnage applying to open the toughest mold. After die break-away the ram moves into high return speed. ERIE Press shown is down-acting. Up-acting rams are optional.

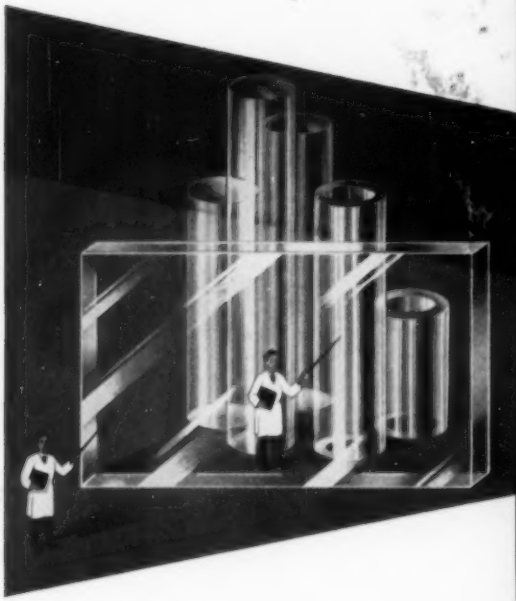
ERIE Fiberglass presses produce more perfect pieces per hour. Write for bulletin.

in our 60th year

ERIE

Today, the greatest name in specialized compression presses

ERIE FOUNDRY CO. ERIE, PA.



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ACETATE
- SHEETS
- FILM

Rohm & Haas
PLEXIGLAS
- SHEETS
- RODS
- TUBES

DuPont
LUCITE
- RODS
- TUBES

DuPont
NYLON
- RODS
- STRIPS
- TUBING
- SLABS
- DISCS

DuPont
TEFLON
- TAPE
- RODS
- TUBES
- SLABS

Bakelite
VINYLITE
- RIGID
- SHEETS

DuPont
POLYETHYLENE
- FILM
- SHEETS
- RODS
- TUBES

POLYSTYRENE
- SHEETS
- RODS
- TUBES
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LAMINATES
- SHEETS
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Seilon paneling separates the serving lines from the dining area in the B. F. Goodrich Company's cafeteria in Akron, Ohio.



This Kaiser-Darrin Jr. midget sport car is a typical example of the way SEILON can be formed without incurring heavy tooling costs.

PRESS-LAMINATED SHEETS

standard sheet size: 48"x96" . . . high and normal impact P.V.C. for corrosion applications . . . decorative P.V.C. panels . . . heavy-gauge, formable high-impact P.V.C.

CALENDERED SHEETS

widths up to 51½". . . superior high-impact polystyrene . . . normal and high-impact P.V.C. for corrosion resistance . . . and formable high-impact P.V.C. for vacuum forming.

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widths up to 48". . . high-impact polystyrene.

It's Decorative!
It's Translucent!
It's Easy to Work!

SEILON is functional as well as decorative . . . a material with almost unlimited applications. It resists the effects of heat, cold, rain, chemicals, oils, greases, acids and alkalis.

It is available in a wide range of colors and in opaque or translucent form. And is available with normal and high-impact properties.

SEILON is easy to work. It can be machined, planed, sawed, drilled, nailed, cemented—can even be welded.

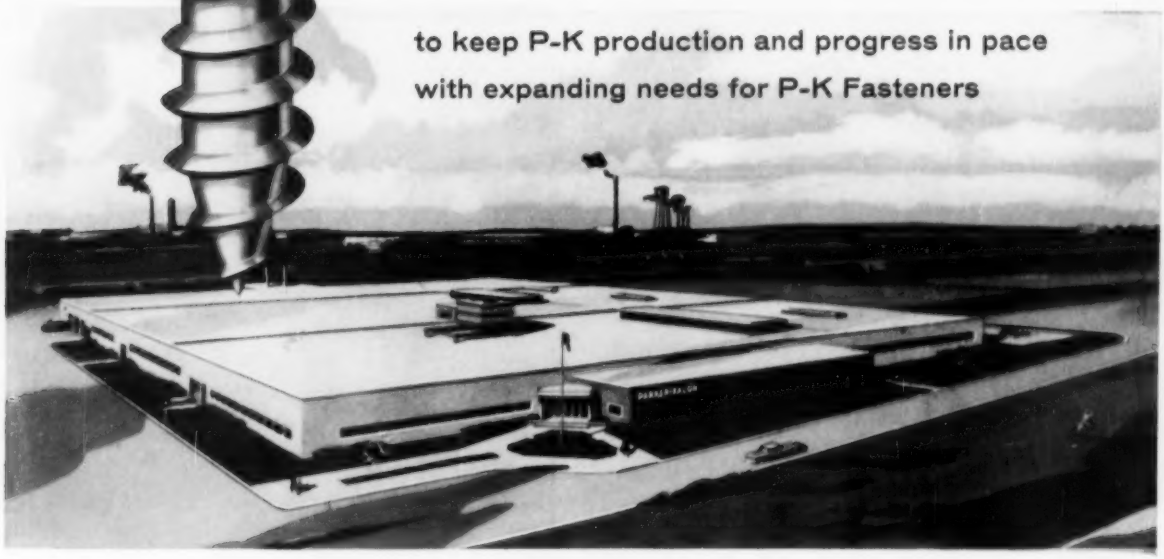


Seiberling Plastics Division is adaptable to customers' requests. We will welcome the opportunity to consult with you on individual specifications of properties, gauges, colors and finishes for your products. Delivery is prompt—can be made in 10 days to two weeks.

Plastics Division **SEIBERLING RUBBER COMPANY**
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a new plant for PARKER-KALON

to keep P-K production and progress in pace with expanding needs for P-K Fasteners



In a few weeks, Parker-Kalon will move to its new plant in Clifton, New Jersey (about 10 miles from New York City). This modern building, containing 267,000 square feet on one floor, is one of the largest plants devoted exclusively to the manufacture of fasteners.

It is planned for the highest efficiency and economy in all operations, with production keyed to the steadily increasing demand for P-K Fasteners throughout industry. Advanced facilities for engineering and research will accelerate P-K progress in development of new and improved fasteners.

Now, more than ever, you can be sure . . . "If it's P-K . . . it's OK!"

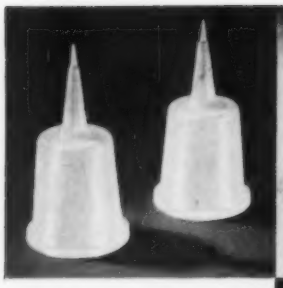


PARKER-KALON DIVISION
General American Transportation Corporation
Clifton, New Jersey.

PARKER-KALON

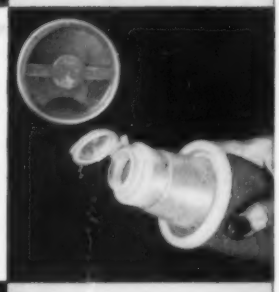
SELF-TAPPING SCREWS – STAPS – SOCKET SCREWS – SCREWNAILS – MASONRY NAILS – WING NUTS – THUMB SCREWS

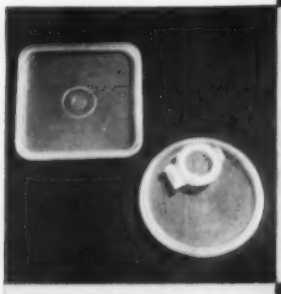
Sold through leading Industrial Distributors





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Tupper Seals are air and liquid-tight flexible covers. The famous Pour All and Por Top covers are designed for easy dispensing. They are made in sizes to fit all Tupperware containers.

The logical molder for you to consult regarding that product or package of yours which is to be made of polyethylene is Tupper. Tupper has done more than any other molder to make molded polyethylene a practical reality.

Aside from having designed, patented, and promoted successful seals, closures, and dispensers for polyethylene containers, the Tupper Corporation has vast experience in *every phase* of polyethylene packaging and polyethylene injection molding. This experience will be of major importance in improving your product, in reducing your costs, when Tupper goes to work for you.

Tupper's combination of experience, technical ingenuity, and the most modern equipment is at your service for the custom molding of your product in polyethylene. You can do no better than the best ...and the best at molding polyethylene is Tupper!







When equipped with Tupper Seals, Tupper Canisters, Sauce Dishes, Wonder Bowls, Cereal Bowls and Funnels in various sizes are the most versatile reusable containers you have ever seen.

TUPPER!
TRADE MARK

TUPPER PRODUCTS ARE FULLY PROTECTED

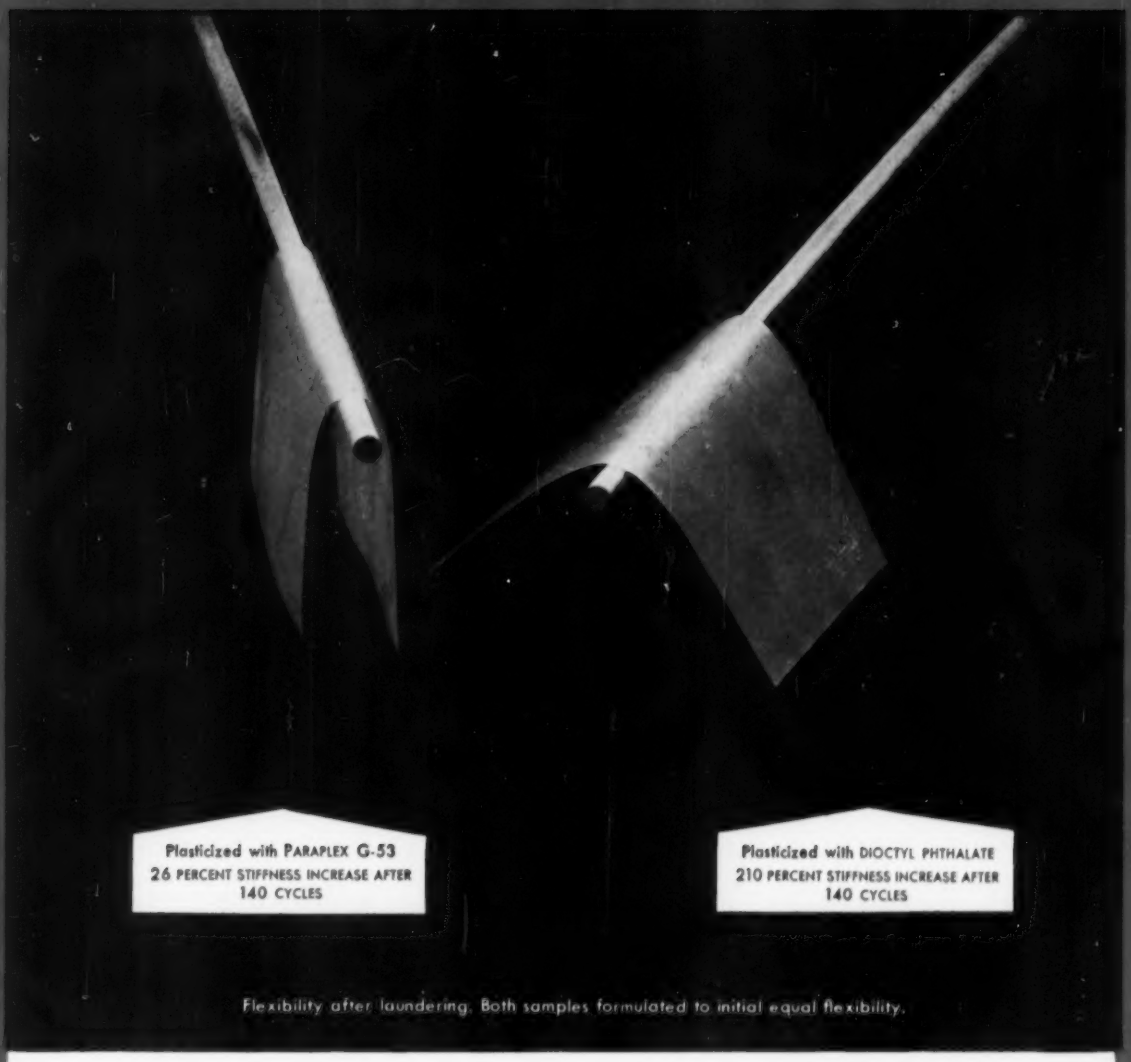
About 150 United States and foreign patents and patents applied for, plus numerous trademarks and copyrights, cover the design and manufacture of the various types of Tupper Seals and other Tupper Products. Unauthorized manufacture of items covered by Tupper patents will subject infringers to prosecution.

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Flexibility after laundering. Both samples formulated to initial equal flexibility.

Watch out for plasticizers that wash out

Washing vinyl products like baby pants or hospital sheeting in hot, soapy water can be pretty tough on the vinyl plasticizer. Tough on an ordinary plasticizer, that is. PARAPLEX G-53 doesn't mind this kind of treatment. For example, samples of vinyl film containing PARAPLEX G-53 and samples containing dioctyl phthalate were laundered repeatedly in an automatic washer together with family wash. The films plasticized with PARAPLEX G-53 remained soft and supple; the others became hard and rigid.

This ability to stay put under actual washing conditions is just one feature of PARAPLEX G-53 polymeric plasticizer. When you add to that the plasticizer's resistance to extraction by aromatic and aliphatic solvents, you've got quite a combination. And what's more—PARAPLEX G-53 rebels against migration into lacquer, polystyrene, rubber, and baked finishes.

Ask for *What You Should Know about* PARAPLEX *and* MONOPLEX *Plasticizers*, a handy summary of properties and uses.

PARAPLEX *and* MONOPLEX *are trademarks, Reg. U. S. Pat. Off. and in principal foreign countries.*

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THE RESINOUS PRODUCTS DIVISION

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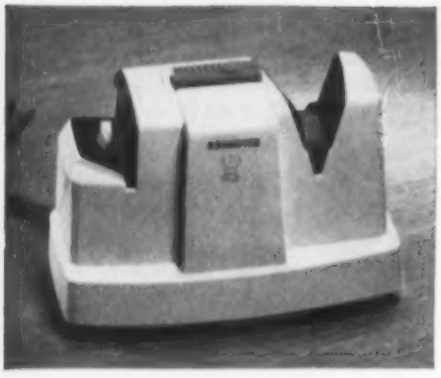
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hercocel®

FOR PRODUCTS ON THE MOVE



EASY TO USE—All it takes to operate the new Dormeyer "Edge-Well" Sharpener is finger-tip pressure on the center bar. For added safety, sharpener stops rotating as soon as pressure is released.



MADE TO LAST—A product of the Dormeyer Corp., Kingsbury and Huron Sts., Chicago 10, Ill., the "Edge-Well" is guaranteed by the manufacturer for one year against defects in material or workmanship. Hercocel housing by Plastic Precision Parts Co., 2535 West Madison St., Chicago, Ill.

As good looking as it is functional, the new Dormeyer "Edge-Well" Knife and Scissor Sharpener is a valued addition to anyone's kitchen. One sharpening wheel quickly gives a perfect edge to knives of any size or type; the other wheel restores scissors to "like new" cutting condition.

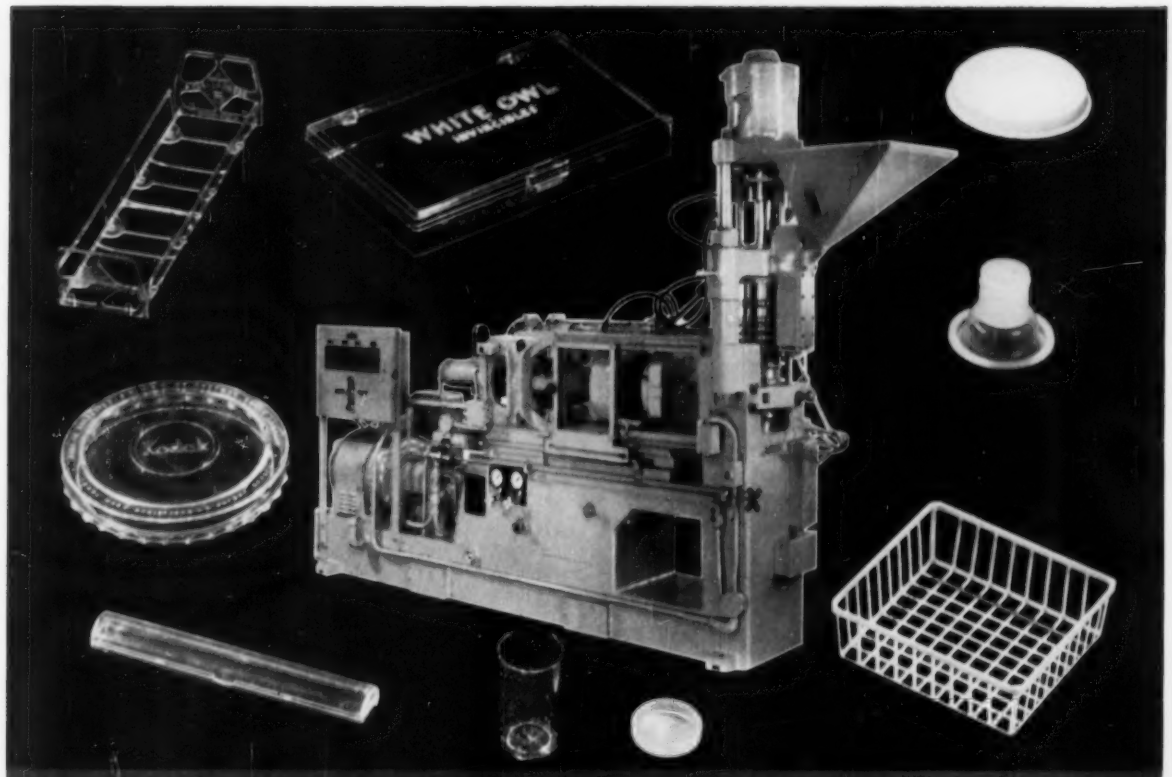
Like so many products today, the "Edge-Well" is molded with Hercocel A—Hercules® cellulose acetate. Long-wearing and durable, Hercocel is the perfect plastic for products that must stand up under hard usage. And Hercocel lends itself to modern styling, provides a finish that means extra sales appeal. In design, production and sales, versatile Hercocel keeps products on the move.

Cellulose Products Department

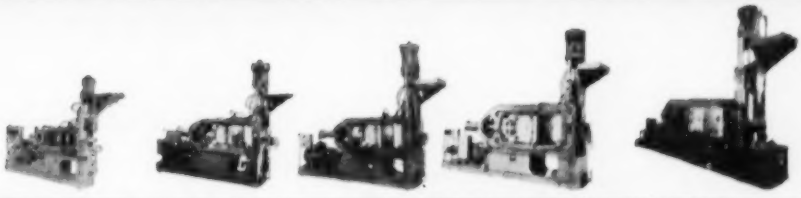
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CPSS-5



Lester AUTOMATIC
Injection Molding Machines



SHOT CAPACITY	4 OZ.	8 OZ.	12 OZ.	20 OZ.	48 OZ.
Locking Tonnage	125	300	400	600	750
Die Opening (inches)	9 to 6 Adjustable	10	12	14	16¼ or 30
Max. Mold Size (inches)	14V x 18H	23V x 28H	26V x 28H	28¼V x 40H	29V x 50H
Equivalent Bar Size (inches)	3½	6	6½	8	9
Dry Cycle (seconds)	6 at 6" opening	10	12½	13	20 at 16¼" opening

Complete specifications available on request from Lester...the only company devoted *exclusively* to the manufacture of injection molding machines and die casting machines.

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And we are ready to prove their superiority! We'll gladly furnish sample cuts of your materials to illustrate the smooth edged, chip-free, close tolerance cut obtained with these saws.

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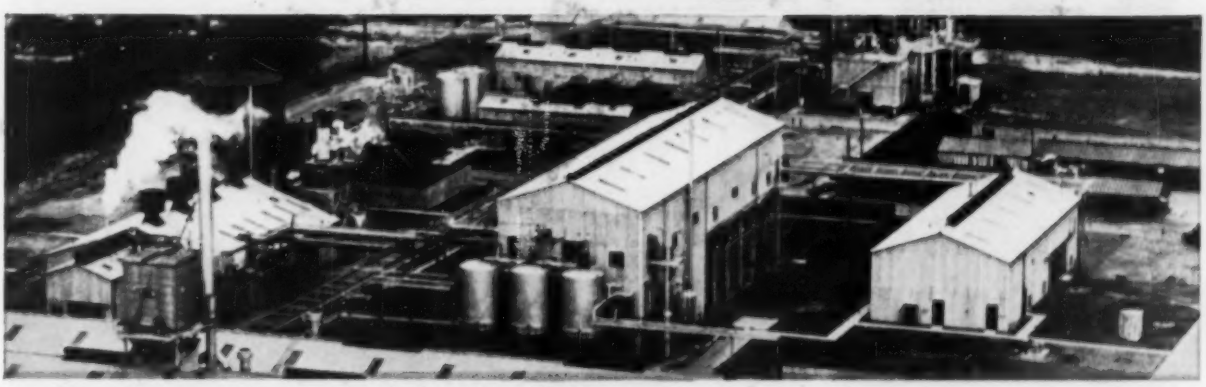
SPECIALISTS AND LEADING MANUFACTURER OF CARBIDE-TIPPED SAW BLADES

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NEW DEVELOPMENTS

4th and 5th PVC Projects Will Use SD's Suspension Process



Recently completed mono and polyvinyl chloride plant designed by SD.



"Less than a year will be required from initial design to commercial operation of the new Thompson Chemical Company PVC plant," according to Thomas P. Brown, Vice-President of SD. "Process design and detailed engineering of the new plant will be finished in a relatively short time because of SD's previous design experience with both small and large PVC plants."

From Henry F. Peters, SD's Assistant Vice-President of Engineering, "As a subsidiary of The Pantasote Company, the Eleonora Chemical Corporation's new PVC plant will produce resin for the parent company's line of plastic film and sheeting. In addition to process design and detailed engineering, SD, as prime contractor, will have full responsibility for construction of the plant as well as initial operation."



New PVC Plants Will Produce Resins of High Purity and Versatility

Since 1951, when only about half the PVC used was produced by the suspension process, this process has been steadily gaining ground. The reason? PVC produced by suspension process costs less to manufacture, has fewer impurities, and greater versatility in application.

SD's suspension process was first proved in collaboration with one of the largest European chemical firms. Subsequently SD designed the General Tire & Rubber Company's $6,000,000 integrated mono and polyvinyl chloride plant in Ashtabula, Ohio.

In design and engineering of these plants, SD's technical staff conceived and designed a flexible, standardized plant. These plants, with production capacities of four to fifteen million pounds, allow manufacturers of plastic products to produce their own PVC for their special requirements. One of these plants is now underway for another leading American manufacturer.

The Thompson Chemical Company and Eleonora Chemical Corporation represent SD's 4th and 5th PVC contracts. There are two reasons for SD's position in this field. First, SD has extremely broad process design experience in the PVC field. Second, SD offers a complete service, assuming entire responsibility from the basic process design and detailed engineering, through construction and initial operation.

On this or any other organic chemical plant design problem, SD's services are available to you on a confidential basis. In new plant construction or the revamping of existing facilities to increase production efficiencies, you will profit by utilizing SD's specialized experience in organic chemicals plant design.

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NO REJECTS HERE!

And you'll get no rejects when you lubricate your molds with Metasap® Zinc or Calcium Stearates. Your finished products pop out of the mold quickly, easily, smoothly.

You can verify this with most any experienced molder.

You can add these Stearates in either of two ways. Incorporate them in the molding compound...or simply dust them onto the mold surface.

Either way, you'll find this improved lubrication *minimizes ejection pressures*, increases your output, improves your product. Your molds last longer, too.

So specify compounds containing Metasap Stearates, or incorporate them directly into your own molding compound. Metasap Technical Service is ready to help you find the materials and mixing procedures best fitted to your production methods.

EXCELLENT THICKENERS FOR PLASTISOLS

Metasap also offers a complete line of quality Stearates, effective as thickening agents. We'll be glad to make available to you free testing samples of Magnesium, Barium, Calcium, or Aluminum Stearates. Ask for yours today.

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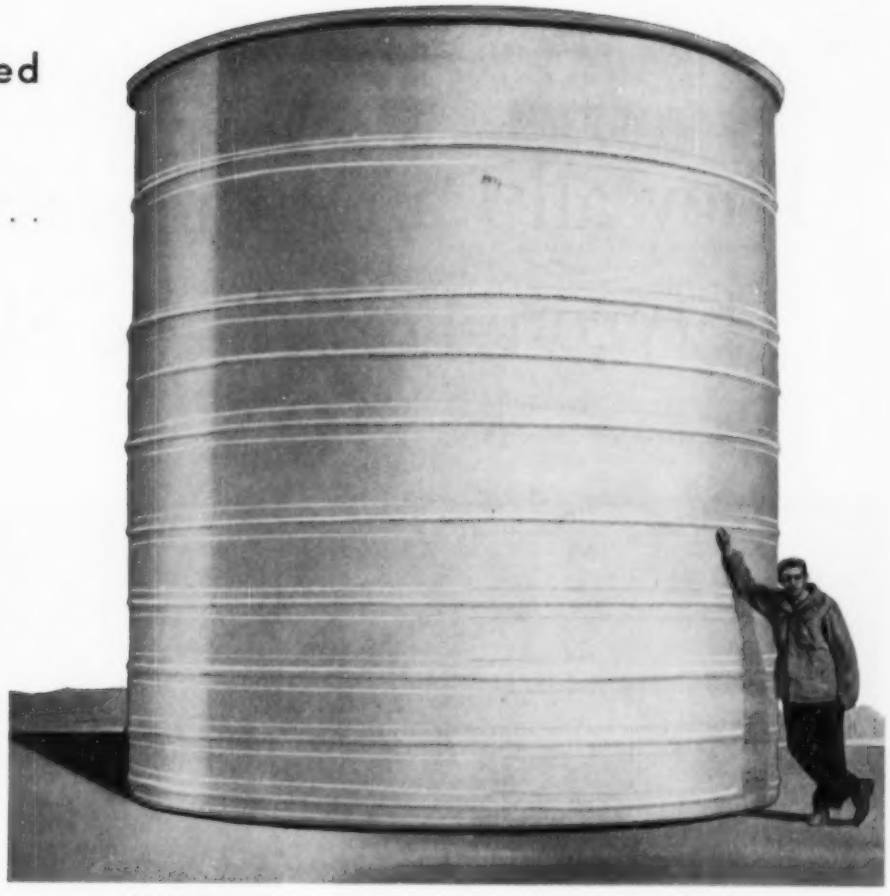
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20,000 gallon tank for waste chemicals fabricated by the Carl N. Beetle Plastics Corp., Fall River, Mass.

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Problem solution through superior reinforcing materials is indeed Bigelow's most important product! This engineering service plus a complete line of glass reinforcing materials—glass mats, woven roving, and glass cloth puts Bigelow Fiber Glass Products way out in front! For further information, fill out this coupon:

Bigelow had a tall order—furnishing a *reinforcement* strong and uniform enough to be used in fabricating a large tank—*and at the lowest possible cost!* The Carl N. Beetle Plastics Corp. selected Bigelow for their record of accomplishment in the fiber glass field.

A unique fiber glass product was engineered—ROVCLOTH 6060-0505 (Bigelow's trade mark for woven roving) . . . 25.5 oz. weight, breaking strength in excess of 900 lbs. in warp and fill, with an .050" thickness, and 108" in width. This resulted in an end product that met all specifications for corrosion-resistance!

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DOW

They all found the answer in Styron 475 Plastic Sheet



EASE OF FABRICATION
FOR JUKE BOXES

The speaker horns, drivers and trim skirts in this manufacturer's juke boxes are formed of Styron® 475 sheet. Here's why: Styron plastic is low in material cost, forming cost, machining cost. It doesn't crack when they saw or staple it. It has dampening qualities horns need for acoustic frequencies, yet isn't subject to undesirable resonances. Its surface formation and color range make it excellent for decorative trim. In short, Styron 475 sheet is one manufacturer's answer to a difficult fabricating problem.



LOW-COST DISPLAY
FOR MODERN DINNERWARE

This display manufacturer was charged with designing a handsome, low-cost display to enhance the sale of plastic dinnerware. After much experimentation, he chose Styron 475 sheet. It proved best—because it formed easily, gave proper rigidity, finished beautifully and produced more displays faster at lower production costs. The display field is just one where the versatility and economy of Styron 475 sheet have proved profitable. Styron 475 sheet may be just what *you* need.

You, too, may find the answer to your fabricating problem in Styron 475 Plastic Sheet. Mail this coupon today!

Plastics Sales Dept., Dept. PL 432R
The Dow Chemical Company, Midland, Mich.
Please rush technical data on Styron 475 Sheet and nearest source of supply:

Name and title_____

Firm name_____

Types of product manufactured_____

Address_____

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DURABILITY AT LOW UNIT COST FOR MILK DISPENSER

This manufacturer was set to add a milk carton dispenser to his line of automatic vending machines. There was no way, however, of forecasting yearly production rates. The problem—an adaptable door liner material that was not only low in unit cost but which could be produced on low-cost tooling. The answer—Styron 475 sheet. The firm which makes the door liners for this manufacturer found Styron 475 sheet not only met every customer requirement . . . but added sales-making bonuses in surface finish, rigidity and insulation.

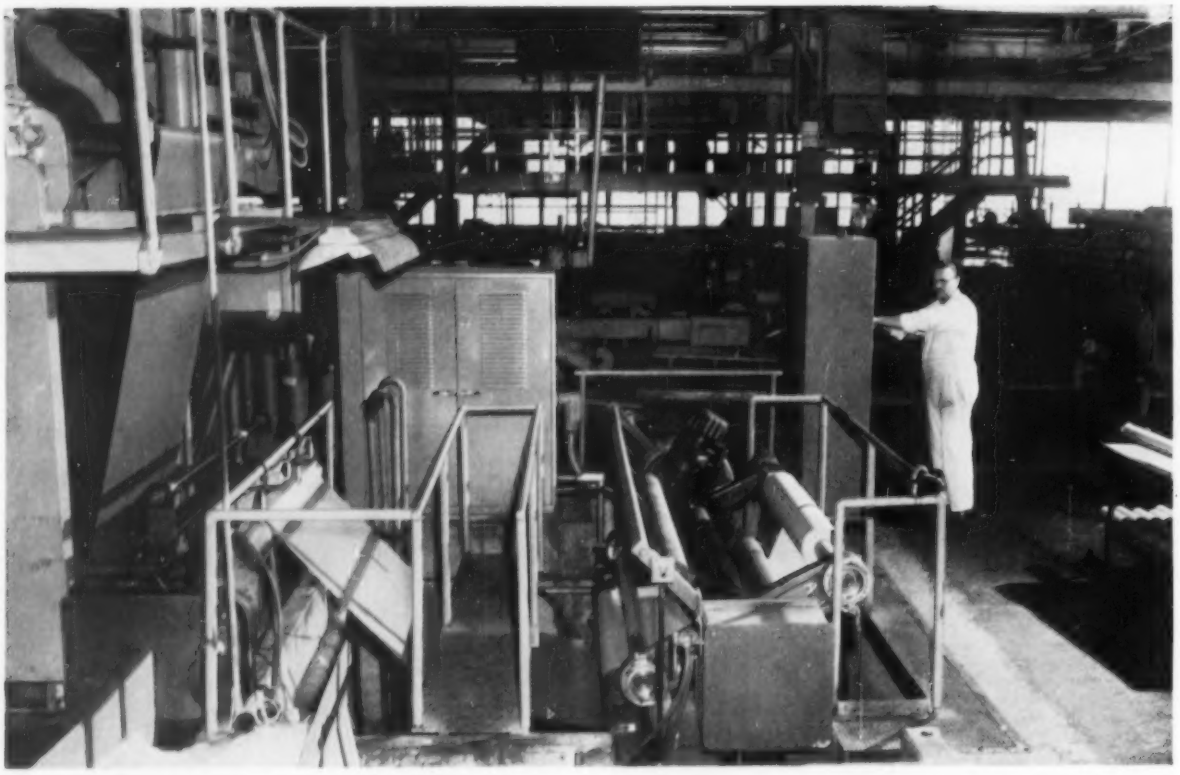


COLORFUL, PREMIUM PACKAGING FOR COTTAGE CHEESE

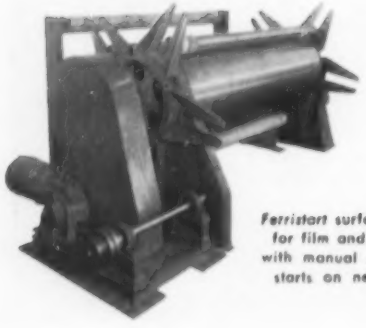
Producing packages that sell goods is a specialty of this manufacturer. When one of his customers requested "something new" to spur sales of his cottage cheese, the manufacturer came up with the now-famous premium Record-Pac. He came up with versatile, non-toxic Styron 475 sheet, too, as the *one* best material for the colorful package. Whatever *you* make, there's a good chance you can put Styron 475 sheet to work for you. So *many* people have found it a profitable answer . . . in making products that last longer, look better, sell faster.

you can depend on DOW PLASTICS

DOW



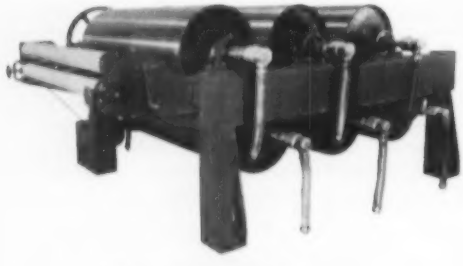
PLASTIC TAKE-OFFS AND WINDERS



Ferristart surface winder for film and sheeting with manual continuous starts on new cores.

This is a Dilts Model 40 2-arm rotating type winder in line with a calender train on production of vinyl film and sheeting. A special dancer roll allows for absolute minimum tension to be held constant over the complete winding cycle. Automatic starts are made without foldbacks or wrinkling. Color movies of this winder in action are available for showing.

Dilts



Cooling train for plastic film and sheeting. Double Wall Construction.

Dilts manufactures complete plastic take-off equipment from calender or extruder to continuous surface or center winders for film and sheeting over a wide range of gages, speeds, tensions, widths and roll diameters.

Write for full information.

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1932—American Agile...an Ohio Corporation...is formed with the recognition and conviction of the purpose and need of new methods and techniques in manufacturing processes resulting from the expansion and progress of the chemical industries.

1949—American Agile is one of the Country's first commercial processors of Polyethylene plastics. Facilities are in operation for the molding and fabrication of welded parts and products that have proved themselves in laboratory and field application.

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1951—American Agile, the first time in America, does commercially the welding of Polyethylene and similar plastic materials. At the same time, developing and making available to all processors of these materials, plastic welding equipment.

1954—American Agile is the first to introduce commercially, Irradiated Molded Polyethylene plastics...(Polyethylene exposed to Atomic Radiation) which resulted in change in the plastics molecular properties and gave the material many added advantages in application and use.

19--—American Agile continues to explore, research and develop new processes...applications and uses for Polyethylene plastics *...for the improvement of your product, at lower cost.*

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Thermatron

HIGH FREQUENCY SEALING AND HEATING EQUIPMENT

The full potential of the new plastic foam is realized when this light fluffy material is *electronically welded* on the THERMATRON . . . and here's why:

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Shapes and tapers the material as it seals. Embosses it, too, if desired.

Produces a permanent bond that won't age or tear – and seals any shape or size.

Welds the foam to itself or to ordinary vinyl.

Does it all *easier*, faster, more economically, with smoother, more attractive seams.

Plastic foam is a *comer* because it lends itself to so many new or improved products, such as pillows, automobile cushions, buoyant toys, upholstered furniture, swim rings, insulated bags . . . It's even being used as the cushion pad on a nationally known strapless bra – THERMATRON welded, of course.

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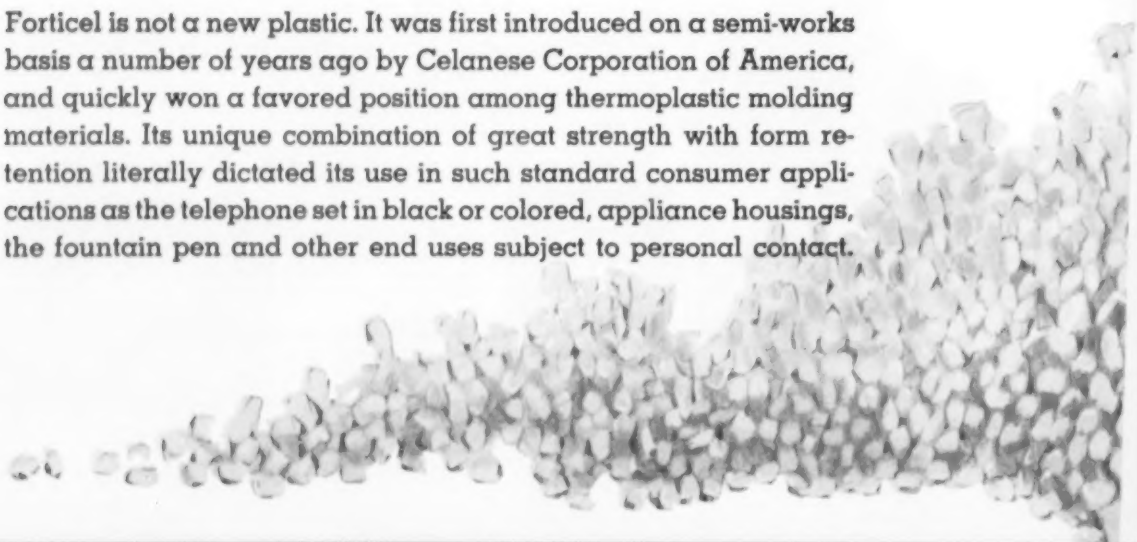
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FORTICEL*

(CELLULOSE PROPIONATE PLASTIC)

High Performance Thermoplastic Molding Material with Outstanding Range of Balanced Properties... Available in Choice of Colors and Formulations

Forticel is not a new plastic. It was first introduced on a semi-works basis a number of years ago by Celanese Corporation of America, and quickly won a favored position among thermoplastic molding materials. Its unique combination of great strength with form retention literally dictated its use in such standard consumer applications as the telephone set in black or colored, appliance housings, the fountain pen and other end uses subject to personal contact.



An Overnight Reputation

Applications like these quickly put Forticel in the forefront position among thermoplastic molding materials. Forticel had the qualities needed by molder and manufacturer. In addition to its toughness and dimensional stability, this cellulosic plastic possesses unusual weatherability, surface beauty and permanence, color, and, perhaps as important as anything else, Forticel is free of objectionable odor.

A Molder's Plastic

In molding performance, Forticel is outstanding. Flow temperatures are not as critical . . . welds are stronger . . . surface details of molded parts are superb . . . flash lines are all but invisible . . . molded surfaces are lustrous, and require little or no buffing or polishing . . . molded-in metal inserts hold firmly.

A Fabricator's Plastic

Forticel also machines well. It can be sawed, cut, drilled, threaded and punched with far less danger of stress lines and crazing. This machinability is of vital importance in such applications as fountain pens and mechanical pencils, toothbrush handles and scale model trains, and appliance housings.

First Production of Forticel Stopped

When originally introduced, Forticel was produced in a pilot plant operation. And, because of the difficulty of obtaining raw materials of acceptable quality and cost, commercial production was delayed until such a time as raw materials could be produced in volume—at a price that would insure a competitive position for Forticel.

Production of the New Forticel Begun

After continued development, the new Forticel is currently moving into full scale production. More important to molder and manufacturer is the news that the raw materials of Forticel are *Celanese produced*—and in volume!

New Facilities For Forticel

To be certain that the supply of Forticel raw materials will be adequate to meet the anticipated demand for this outstanding plastic, Celanese has installed new facilities for their production. This will insure a dependable source of supply. These facilities will produce Propionic Acid and other petrochemicals necessary to Forticel manufacture.

The New Forticel

What about the new Forticel? What is it like? What makes it the right plastic for appliance housings, automotive steering wheels, accessories, scale models, sunglass frames, fountain pens, etc.? In the first place, today's Forticel is an even better plastic than its predecessor. This is the result of continued research into the development of new plasticizers, and improvements in processing.

A cellulosic, Forticel has *natural* impact strength or toughness. This is combined with a fine balance of desirable properties including, form retention, low mold shrinkage, weatherability and surface hardness. The new Forticel is available in a full color range, and supplied in uniform pellet size. Sample quantities are available for evaluation. The New Product Bulletin, NP-16 is ready for distribution. This bulletin covers the complete Forticel story from chemical and physical properties to molding and fabricating.

Celanese Corporation of America, Plastics Division, Dept. 101-L, 290 Ferry Street, Newark 5, N. J. Canadian affiliate, Canadian Chemical Company, Limited, Montreal, Toronto and Vancouver.

Typical Physical Properties of Forticel

Flow temperature	(°C.) (A.S.T.M.)	D569-48	167—178
Specific gravity		D176-42T	1.18—1.21
Tensile properties:	Yield (p.s.i.)	D638-52T	3380—5020
	Break (p.s.i.)	D638-52T	3470—5240
	Elongation (%)	D638-52T	56—66
Flexural properties:	Flexural strength (p.s.i. at break)	D790-49T	8400—8500
	Flexural modulus (10^5 p.s.i.)	D790-49T	0.23—0.38
Rockwell Hardness:	(*R* scale)	D785-51	82—84
Izod Impact	(ft. lb./in. notch)	D256-43T	2.7—11.0
Heat distortion	(°C.)	D648-45T	59—70
Water absorption—	% Sol. lost	D570-42	0.00—0.08
	% Moisture gain	D570-42	1.5—1.8
	% Water absorption	D570-42	1.6—1.8

Celanese* PLASTICS

*Reg. U. S. Pat. Off.

PROVEN DESIGN PLUS COLUMBIA "KNOW HOW"

gives you
a better press
for every dollar
of purchase price



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Model 24T250, 24" x 24" platens, 250 tons pressure.

LODGE & SHIPLEY is producing Columbia Compression Moulding Presses equal or superior to any other. These presses offer many features which contribute to cost saving operations and are available in single or multiple unit installations.

Columbia Presses are built to Lodge & Shipley standards of strength and accuracy for long service and minimum maintenance. For example, the base and crown are steel weldments, designed and constructed for maximum rigidity. The strain rods and nuts are special alloy steel in special designs to assure continuing accuracy and freedom from maintenance.

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Give yourself more press for the money, check the many features of Lodge & Shipley Presses against any other press . . . then make your decision.

Write for FREE Bulletin HP-9 and the name of your nearest distributor.

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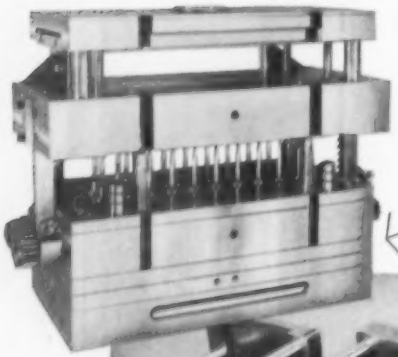
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ANOTHER PROBLEM IN PLASTICS MOLDING SOLVED BY *J.G.TILP INC.*

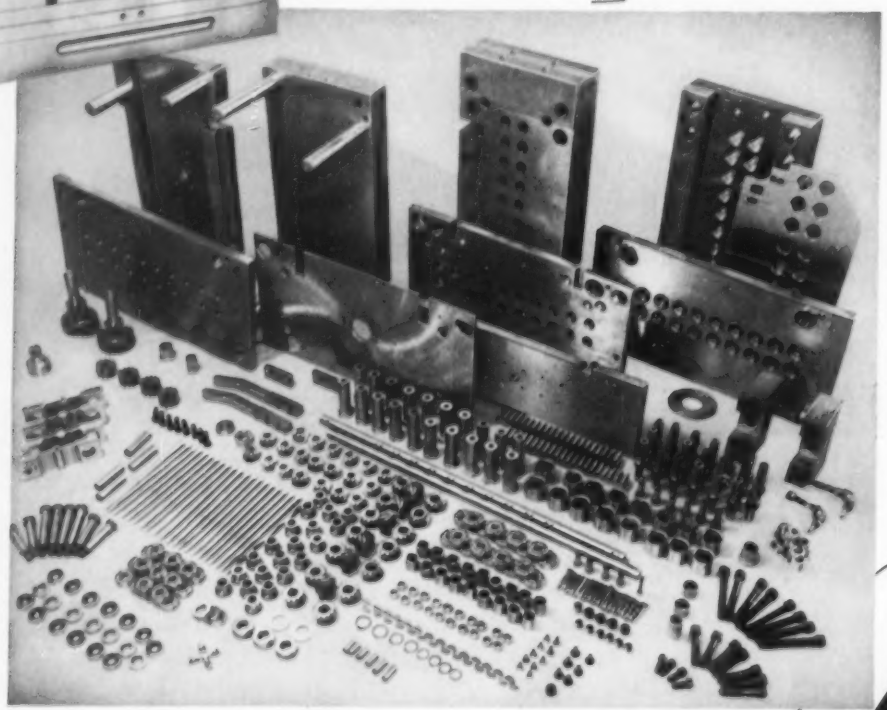
THE PROBLEM — To construct a mold for fountain pen barrels that would:
.. eliminate a seam on the thread
.. incorporate pin-point gating
.. accomplish ejection within a limited 10″ stroke



THE SOLUTION — A self-contained automatic unscrewing mold with special air ejection, consisting of over 500 parts

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Better mouldings are *inevitable* when you let Deeglas Chopped Glass Fibre Mat provide that *extra* strength needed to make plastic mouldings stronger and lighter. For Deeglas, in addition to being easy to handle and simple to mould, has outstanding tensile strength — distributed evenly throughout the plastic because of the constancy of density and fibre found in Deeglas mat. Available as rovings, chopped fibre, or cloth, Deeglas is worth looking into if your problem is how to put strength into your plastics. And, by the way, Deeglas is now available with a superior moisture-resistant Silane size.

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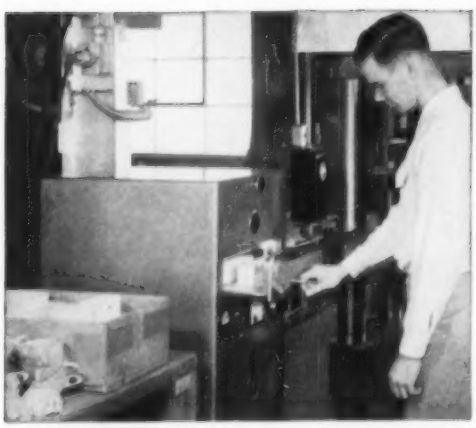


Kenneth B. Welch, Pres. (left) and Roger R. Sacia, V. P., Kenro Corporation, discuss the uniform high quality of their "Holiday" dinnerware.

Thermex
PLASTIC PREHEATING APPARATUS

"It gives us more for our money"

Says KENNETH B. WELCH, *President*
Kenro Corporation



Preference of operators for THERMEX Preheaters was a strong point in Kenro's decision favoring these units. Gordon D. Becker is shown with one of their two 3KW units.

PROGRESSIVE Kenro Corporation, Fredonia, Wisconsin . . . manufacturer of attractive, break-resistant "Holiday" dinnerware . . . expresses its enthusiasm for THERMEX* Plastics Preheaters in the words of its President, Kenneth B. Welch:

"After trying several makes of preheaters, we found the Girdler unit superior. We preferred it because it is designed better . . . more compact, easier to operate and its heating is even and dependable. We think it gives us more for our money."

On the basis of the tests, Kenro purchased a 3KW THERMEX Preheater in October, 1953 and another in December, 1953. Both units operate 18 hours per day, 5 days per week.

Find out how *you* can cut curing time and improve quality of products with THERMEX Dielectric Preheating Apparatus. Call or write The Girdler Company, Thermex Division, Louisville 1, Kentucky.

*THERMEX—Trade Mark Reg. U.S. Pat. Off.

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How Chlorowax® can help you push down vinyl compounding costs

When you are looking for ways to cut costs . . . look at Chlorowax 40 as a secondary plasticizer.

It has a proved record of many cases where it has cut compounding costs by 1.5c to 2.5c per pound volume, without impairing the finished product. In some instances, it has improved quality.

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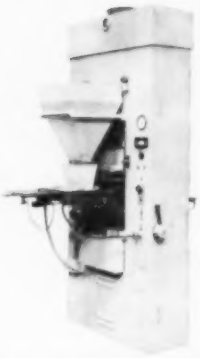
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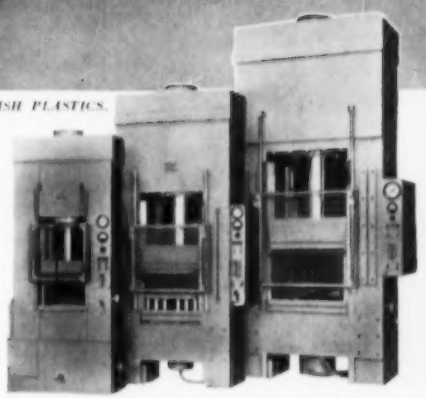
Portion of installations at M. K. Electric, Ltd., courtesy BRITISH PLASTICS.

BIPEL

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Bipel Compression-Transfer Presses can be delivered as fully automatic units (up to 170 tons capacity), as shown above. *Requiring no more floor space*, the loading board occupies no more area than an operator with a semi-automatic press. The automatic models are *ideal for semi-automatic molding, too* . . . converted at the flick of a switch. Remarkably *clean* in operation, these units feature an *extremely fast, but adjustable, operating speed*. Hydraulic ejection. Write for full particulars.

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The zenith in precision and economy, BIPEL Compression-Transfer Presses are unmatched anywhere for their *high output and low maintenance . . . with rejects virtually eliminated*. The amazing "Auto-Control" automatically reproduces any required molding cycle at the touch of a button! Compact, devoid of superfluous piping and projecting "accessories", these units are ideal for single or multiple installations, in a minimum of space. *Write for full information.*

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MODEL 60, ¾ oz. injection capacity per shot. Mold size 6"x5"x5⅛". 5.5 lbs. per hour plasticizing capacity. Molds 6 sq. in. of area. 4 lbs. capacity of material hopper. Hydraulic system for injection. Features semi-automatic knockout arrangement for fast operation and quick mold change.



MODEL 40, Bench model, ¾ oz. cap., complete with standard equipment, hand knockout, only $350. MODEL 41, Floor model, complete with standard equipment; foot die knockout.



MODEL 50, Similar to Model 40, except it is provided with hydraulic system for injection instead of manual operation. ¾ oz. capacity, features simplified knockout arrangement.

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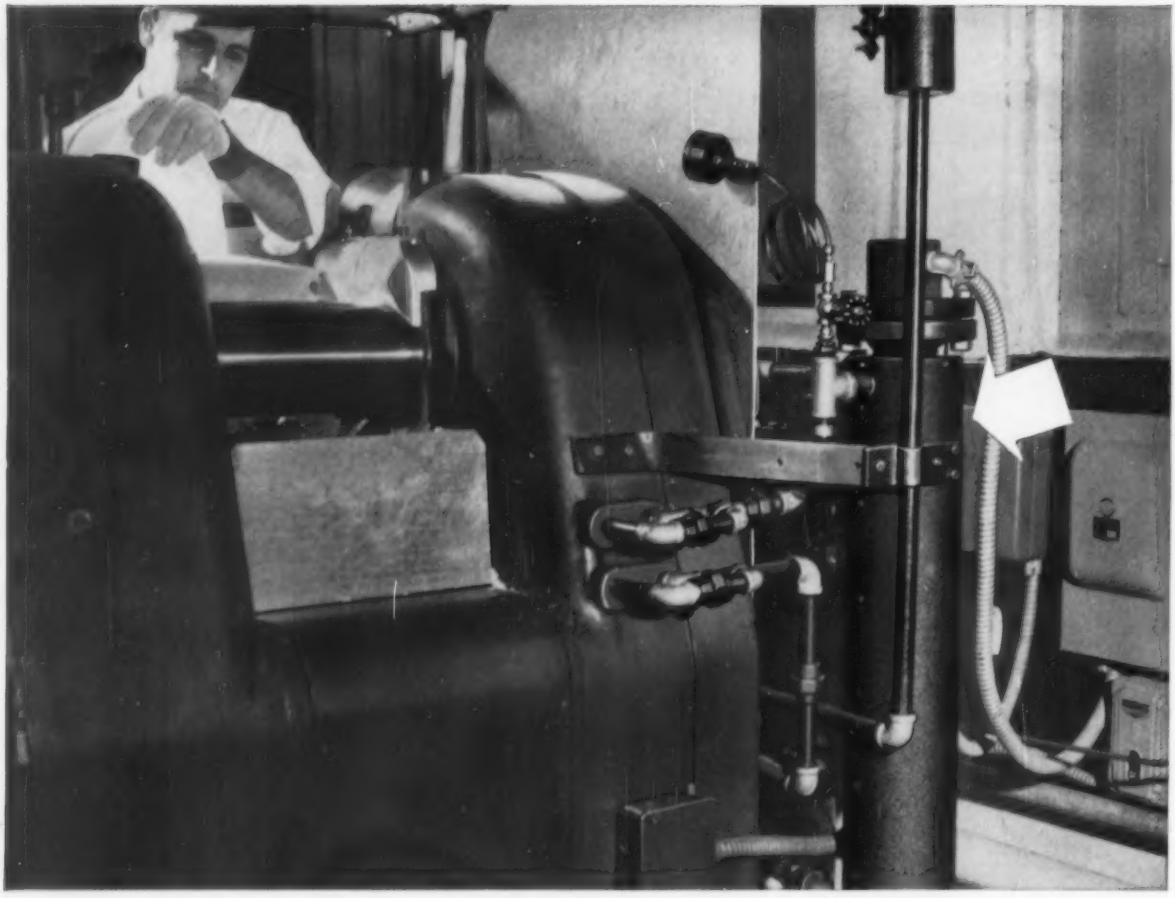
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electrically heated oil eliminates high-pressure steam ... improves performance of plastic blending mill

To heat a plastic blending mill to temperatures ranging from 200 to 450°F was the problem faced by this manufacturer of extruded plastic films.

A steam system did not prove entirely adequate. For in order to supply the higher temperatures, it required high pressures. This put considerable strain on the expensive blending machine and other parts of the system. Losses in production time and material occurred while "waiting for pressure" during temperature changes.

Attaching a Chromalox Electric Oil Circulation Heater to the blending machine solved the problem . . . for electric heat generates high temperatures without high pressures. Heater inlet and outlet are attached directly to the steam lines. An oil circulating pump forces hot oil through the mill rolls. Installed capacity is 15,000 watts. Built-in automatic control measures out exact degree of heat to provide wide range of temperatures needed for fast, accurate blending.

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The MARVIBOND Process—developed and licensed by Naugatuck—makes possible the bonding of sheets of specially-compounded vinyl plastic to sheets of steel, aluminum, magnesium or other metals. This plastic finish is easily wiped clean, resists wear, exposure, chemicals and oils. After laminating, the flat sheets can be formed, crimped, punched, drilled and sheared very much like ordinary sheet metal.

Just think of all the product applications for sheet metal with a color textured plastic finish... or for plastic reinforced by metal! The possibilities are limitless.

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Does the idea ring a bell? Then contact us for the names of MARVIBOND† Process licensees who can supply you with Marvibonded laminates for your requirements.

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Please send me a copy of BULLETIN 104 describing the redesigned LEWIS "4" injection molding machine.

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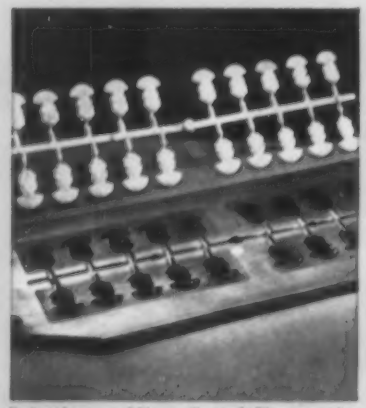
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Injection molding dies of Epon resin (left) reduce costs 80% for Adams Plastic Products, Cincinnati, Ohio. Duplicate patterns (center) are made to close



tolerances with Epon resin by Crane Company, Chicago, Ill. Epon resin dies for outboard motor housing (right) are one-third cost of comparable metal dies



for Clinton Machine Company, Maquoketa, Ia. Formulations for these three applications supplied by Kish Industries, Inc., Lansing, Mich.

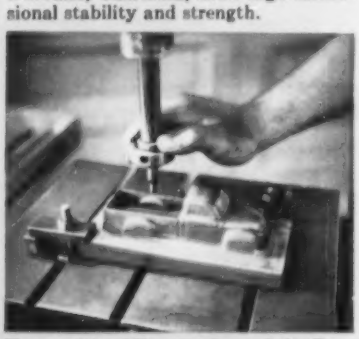
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Little machining and handwork are required to finish Epon resin tools, dies, and patterns, because the material can be cast to very close tolerances. No specialized equipment is needed, because Epon resin tools are cured at room temperature.

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Where Epon resin tools are used

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Find out more

Savings of 80% over the cost of comparable metal tools have been reported by tool- and die-makers. How much can you save in your operations? Best way to find out—write for technical literature on the use of Epon resin in tool and die applications.

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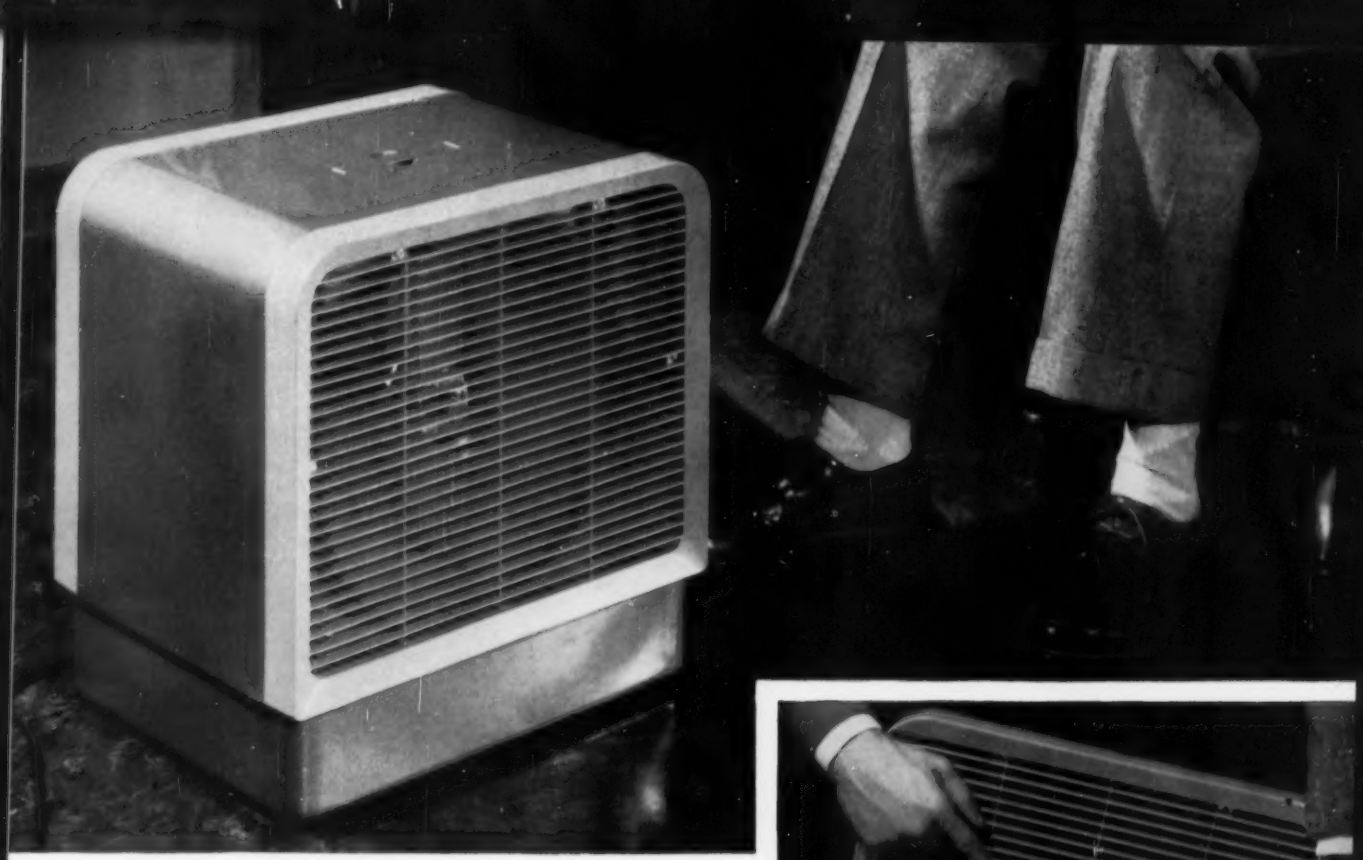


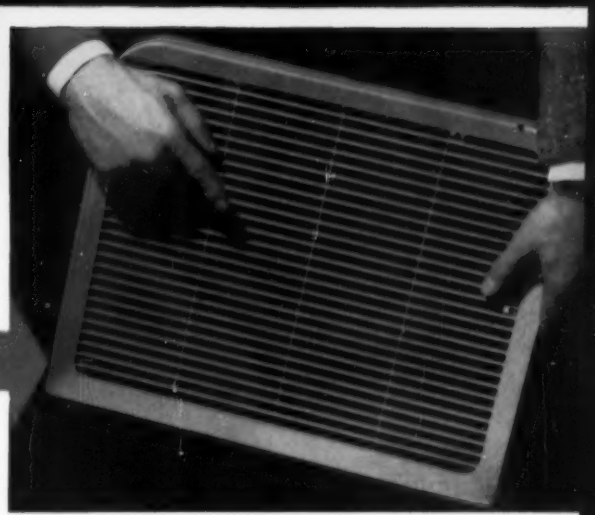
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The Carry Cool Portable Room Cooler is manufactured by the Utility Appliance Corp., Los Angeles, Calif. It features a 2-speed fan, 3-gal. water reservoir, air filter and 12" fan blade. The Carry Cool can be used to cool or exhaust air. The Dylene polystyrene grille is molded by the Mutual Plastic Mold Co., Los Angeles, Calif.

Complex Safety Grille

made quickly with 22-oz. shot of fast-flowing Dylene* polystyrene

It takes an intricate die to form this fan grille, and it takes a fast-flowing plastic to fill all 27 of the ½"-deep louvers. A 22-oz. shot of medium impact Dylene polystyrene by Koppers did the job—quickly, economically. The attractive safety grille is light weight, easy-to-clean and impact-resistant.

Many manufacturers reduce costs and add color to their products by using Dylene housings, knobs, grilles and frames. You can mold Dylene plastic in any shape you need. And it *keeps* its bright, shiny look because the color goes clear through the plastic.

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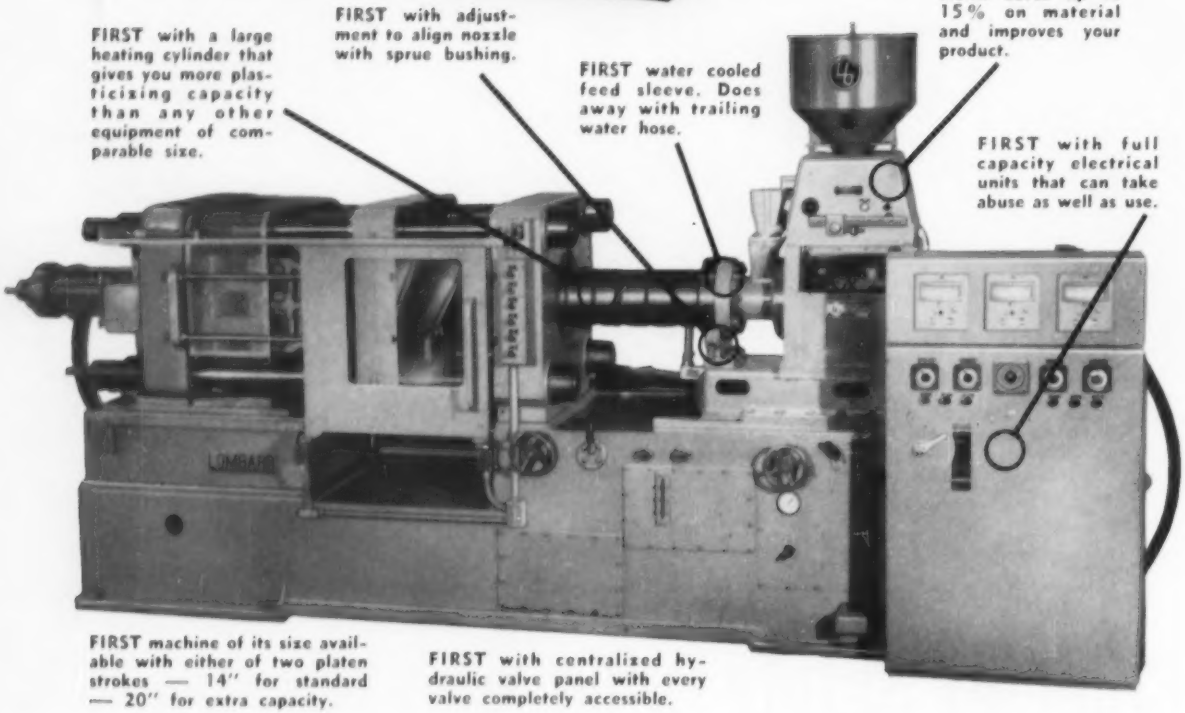
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New	**NL F-22** (semi-polymeric)	— 16.5	5		1.480	0.977	.36	High quality extruded and calendered products
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	NL A-20 (DOP)	— 10	14	30	1.484	0.985	.305	General purpose
	NL A-30 (DIOP)	— 9	11	30	1.484	0.984	.305	General purpose
New	**NL A-40 (DDP)**	— 6	3	50	1.482	0.965	.305	Plastisols and wire insulations
New	**NL A-50 (ODP)**	— 7	7	35	1.484	0.975	.305	General purpose
	NL C-20 (DOS)	— 36	7		1.450	0.915	.61	General purpose with extremely high quality

*Typical plastic mix. Details on request.



Take a *New* look

at the latest developments in "Dutch Boy" Plasticizers

See for yourself their outstanding competitive advantages

Look first at NL F-22, 32 and 33

New. Unique. NL F-22, 32 and 33 are "Dutch Boy" Double-Duty Plasticizers . . . a new type that gives you factory prebalanced low temperature flexibility and low volatility plus good stability and purity. See columns two and three, noting the high values of *both* properties. Note, too, that NL F-22 has outstanding low volatility.

A fourth "Dutch Boy" Double-Duty Plasticizer, NL F-41, is equally outstanding for low temperature flexibility.

Together, these four "F" Plasticizers make a valuable contribution to the materials available for producing vinyl film, sheeting and flooring compounds.

Now look at NL A-40 and 50

These two new "Dutch Boy" standard Plasticizers reach a new high in commercial purity.

This new high in purity makes "Dutch Boy" NL A-40 particularly interesting to the insulated wire industry . . . makes "Dutch Boy" NL A-50 the logical ODP to replace DOP.

Exceptional purity also characterizes the other "Dutch Boy" standard Plasticizers . . . NL A-10, 20 and 30 and NL C-20.

When it comes to formulating economical electrical insulations, Dutch Boy NL A-54 is in a class by itself . . . a low cost material with high electrical properties. See columns 4 and 7 especially.

If you would like full technical information on any of these plasticizers . . . or samples . . . write:



Dutch Boy® CHEMICALS

NATIONAL LEAD COMPANY

111 Broadway, New York 6, N. Y.

In Canada: CANADIAN TITANIUM PIGMENTS LIMITED
630 Dorchester Street, West - Montreal

Use Duramold



for Economical Cold-Hobbing

You can always count on economy when you use Duramold A, B or C for the cold-hobbing of plastic dies. These three grades of Bethlehem tool steel are ideal for economical cold-hobbing because of their relative cleanliness and freedom from both surface and internal defects. Not only that, they are also capable of producing dies which take a mirror-like polish.

In addition to the Duramold tool steels, Bethlehem also produces a full line of machined-cavity and master-hob steels. If you would like to learn more about any of these fine steels, and the jobs they do, call your Bethlehem tool-steel distributor. Or get in touch with the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Duramold A

Air-hardening. Is annealed to softness of 109 max Brinell. Can be hobbed easily. Capable of high core strength (RC-30). After carburizing, surface can be polished to high lustre.

Duramold B

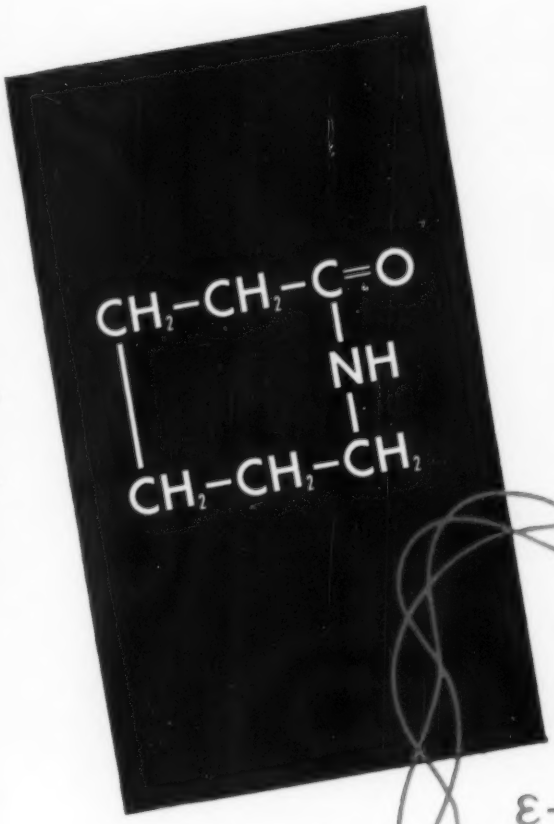
Oil-hardening. Annealed to under 100 Brinell. Boron effectively increases core-strength, with no sacrifice of hobability.

Duramold C

Water-hardening. A low-carbon steel, and easiest of the three grades to hob as it is annealed to 90 max Brinell. Can develop case-hardness of RC-62, after carburizing.

BETHLEHEM TOOL STEELS

BETHLEHEM STEEL



National Aniline Announces

First American Tonnage Production

of an interesting reactive intermediate

NATIONAL®

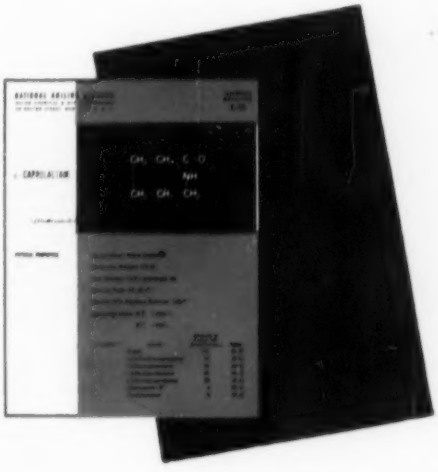
ε-CAPROLACTAM

(2-Oxohexamethylenimine)

Available for the first time in large tonnage, this high-purity ε-Caprolactam should find important uses in new organic chemical developments. Our modern Hopewell, Va. plant has ample production to supply projected requirements and our output can be further expanded to meet any foreseeable commercial need at attractive volume prices.

WRITE FOR TECHNICAL BULLETIN I-14

To assist prospective users of this unusual 6-carbon chemical, National CAPROLACTAM, we have prepared a 12-page brochure containing complete physical properties, known chemical reactions, suggested uses, and a bibliography. Samples and additional technical help are freely available to those whose work may develop new uses for National CAPROLACTAM.

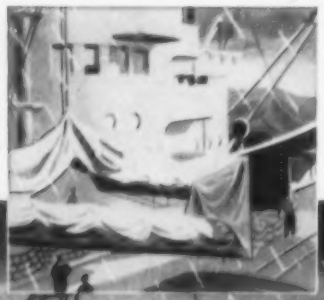


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ALLIED CHEMICAL & DYE CORPORATION

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WELKOTE—Wellington Sears nylon backing fabric, when neoprene or vinyl-coated, combines light weight plus strength for a multitude of protective covering uses. Besides all-weather hatch tents for shiploading, these include playing field covers, machinery and freight tarpaulins, fumigation tents, etc.



Wellington Sears fabrics back up the versatility of these coated materials



For coated auto and furniture upholstery, luggage, handbags, wall coverings and many other end uses, Wellington Sears backing fabrics include cotton sheetings and drills, twills, sateens and ducks; spun rayon, "Welkote" filament nylon and other synthetics; "KnitKote" cotton knit fabric; "Lantuck" and "Lantuck-NR" (nylon-rayon) non-woven fabrics. All end-use "engineered."

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This is where Wellington Sears enters the picture. Nowhere else will you be able to match our many decades of experience with fabrics of this type. And nowhere else will you find such a complete range of different base fabrics for every conceivable plastic and rubber coating use.

Wellington Sears makes the backing fabric only—not the finished coated product. So, if you have a coating problem—or any problem that involves fabric in combination with rubber or plastics—let our experience go to work for you. For booklet, "Modern Textiles For Industry," address Dept. K-12.

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FIRST in Fabrics For Industry

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Monsanto's versatile line of plasticizers meets every need from film . . . to floor tile



S-160 . . . Santicizer 160, the lowest-cost primary plasticizer, offers excellent heat and light stability, grease, oil, water and stain resistance. In addition, this product possesses excellent fusion characteristics and imparts good low-temperature flexibility to PVC compounds. Handles large quantities of fillers well. Widely used alone and in combination with other plasticizers such as DIDP.

DIDP . . . Compounds plasticized with diisodecyl phthalate possess excellent flexibility, retention of physical properties after severe heat aging, good plastisol viscosity stability and resistance to extraction by soapy water. In addition, they have lower pound-volume cost, volatility, and alkali extraction than DOP. Blends well with S-160.

S-606 and **S-613** (mixed phthalates) . . Blends of S-160 and DIDP combining, at an attractive price, the best properties of each plasticizer. They also have better grease and stain resistance and faster processing than DOP with comparable volatility. Specially suited for vinyl floor tile.



S-141 . . . Santicizer 141 is an excellent *nontoxic* plasticizer offering superior flame retardance and the same low-temperature flex as DOP, *plus* improved light stability, stain and oil resistance and faster fusion and processing characteristics. Used in food wrapping, paper coating, film, sheeting. Pound-volume cost is less than the phosphate esters such as TCP. Made only by Monsanto!

Santicizer: Reg. U. S. Pat. Off.

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Please send facts on:
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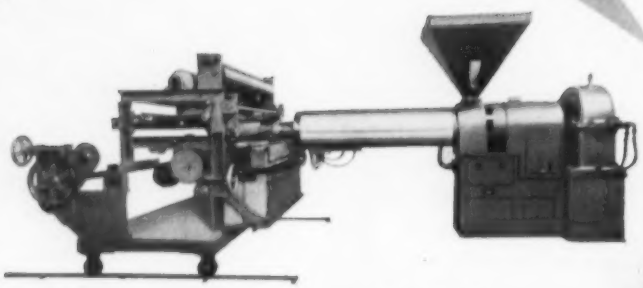
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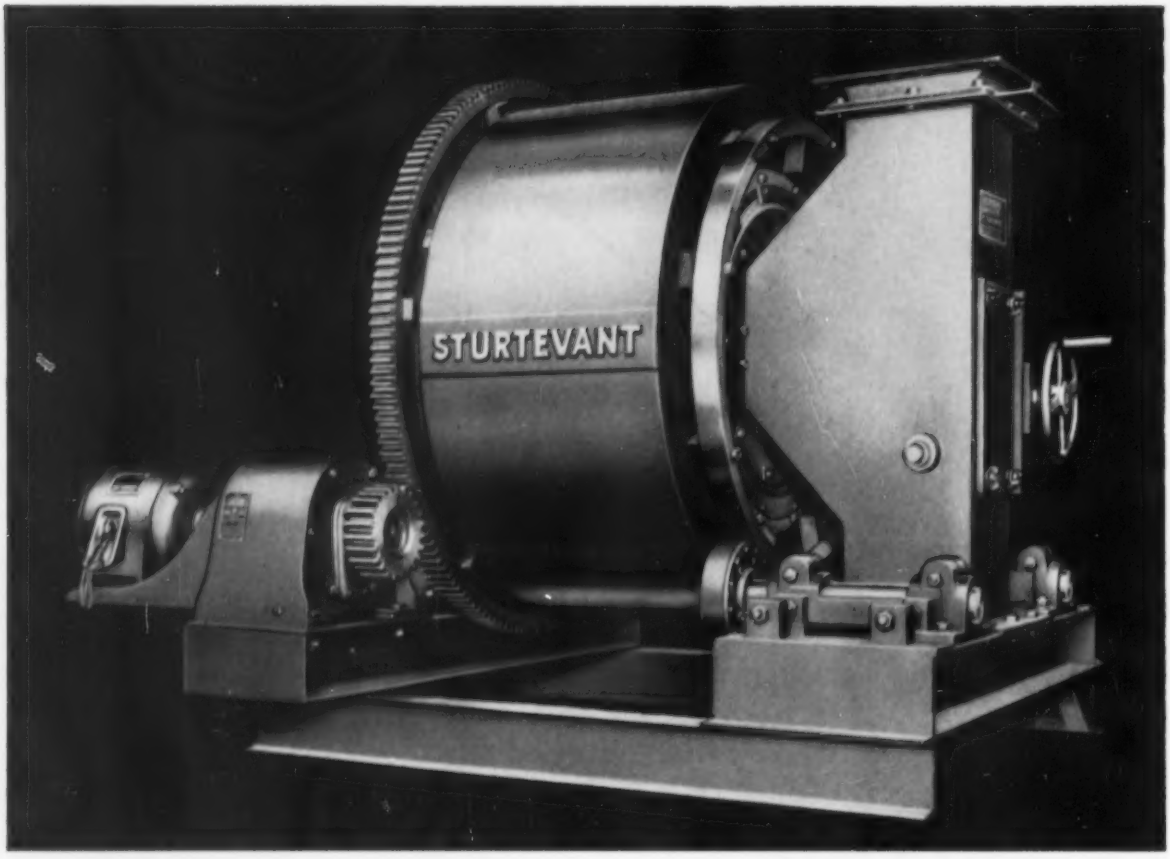
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This unique Zinsser development in organic pyrazalonel has appeal throughout the entire plastics industry. Big organizations, as well as small — regularly order this fine quality pigment—especially when a rich amber tone is desired.
It incorporates the solubility of a dye — the permanence and heat stability of a pigment — and a crystal clear transparency.
Why not check its possibilities regarding your product.
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STURTEVANT *Dry-Batch* BLENDER

Provides Quick, Thorough Mixing of Materials ...Cuts Production Costs

Compare These Advantages

- Only one lever controls both receiving and discharging for simplicity of operation. Hand wheel operates rack and pinion slide at feed opening.
- 4-way mixing action speeds production . . . assures thorough blends.
- "Open-door" accessibility permits easy, fast, thorough cleaning.
- Single aperture drum for both intake and discharge.
- Unusually efficient scoops pick up materials to effect thorough mixing as drum revolves.
- 9 models . . . a size for every job . . . from 10 cu. ft. to 900 cu. ft. batches.

Sturtevant Dry-Batch Mixers are available in standard models with capacities from 500 to 20,000 lbs. Special models with higher capacities are also available. Write for information or engineering assistance.

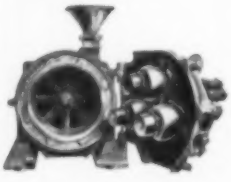
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DESIGNERS & MANUFACTURERS OF
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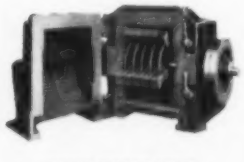
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RING-ROLL MILLS
For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operated in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



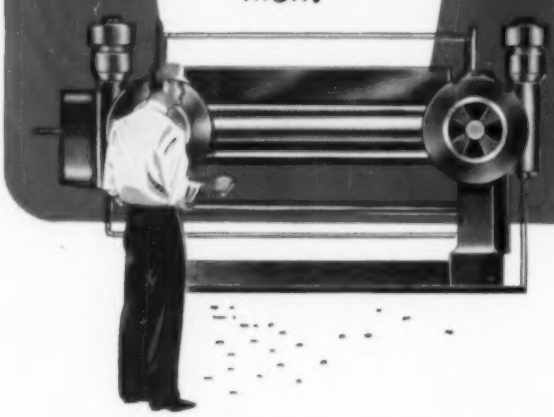
AIR SEPARATOR
For separation of fines to 325 mesh and finer. Increases output from 25% to 300% . . . lowers power costs by 50%. Capacities ¼ to 50 tons per hour output.



SWING-SLEDGE MILLS
For coarse and medium reduction (down to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.

Improved Qualities start here-

for Cost-minded Production men!



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for Every Purpose-

★ *to Aid Processing*
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POLYCIZER DOS — Dioctyl Sebacate
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POLYCIZER 332 — Dioctyl Adipate
POLYCIZER 532 — Octyl Decyl Adipate
POLYCIZER 562 — Octyl Decyl Phthalate
POLYCIZER 632 — Didecyl Adipate
POLYCIZER 662 — Didecyl Phthalate

COLORS:

STAN-TONE MBS MASTERBATCH . . . For use in rubber and vinyl.
STAN-TONE PC — paste for plastisols and preblends.
STAN-TONE DRY — All types.
STAN-TONE GPE — Ground polyethylene dispersion compatible with rubber, vinyl and polyethylene.

STABILIZERS

STABELAN HR-50 — (Fluid Paste) For all Plastisol formulations. Contains plasticizer in addition to cadmium and barium with synergized chelating agent.

STABELAN HR—PASTE . . . "Single Package" stabilizer with cadmium and barium and synergized chelating agent.

STABELAN HR—LIQUID . . . Synergized chelating agent.

STABELAN HR—POWDER . . . Metal bearing components of STABELAN HR Paste.

* Registered U. S. Patent Office

Here are vital components of many of your compounding needs . . . POLYCIZERS for your Plasticizer needs to give important improvements to your products — and to contribute essential economies in your production program . . . Colors for all types of products that stimulate product acceptance . . . And Stabilizers that add much to the workability of your compounds, and that contribute to greater life in service of the finished products. Write for complete data on these important compounding materials.

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KEL-F® dispersion-coated tank truck transports corrosive chemicals



BAKE OVEN at Kellogg Plant, Jersey City, N. J. Overall length 85 ft., width 12 ft., height 12 ft., iso-thermal control, ±5°F. This new Kellogg oven is being used to develop improved techniques for large area applications.



QUENCHING—After final baking, tank is quenched to produce tough, transparent, flexible coating.

This tank, which is designed to transport corrosive chemicals without danger of contamination of the final product, was spray coated with KEL-F Dispersions at the Kellogg plant in Jersey City, and baked-fused in a specially built oven large enough to complete each coating in a single operation. Preliminary tests were carried out with a slightly smaller tank, and the correct techniques developed before proceeding with the coating operations on the tank truck.

KEL-F DISPERSIONS—NEW WEAPON IN FIGHT AGAINST CORROSION

KEL-F Dispersions are finely divided fluorocarbon plastic solids in a volatile medium. Applied by spray, dip or spread coating, they are fused by heat into a tough, impervious coating—firmly bonded to the surface on which applied, and providing a chemical and temperature resistant surface that is anti-sticking and self-cleaning.

This liquid chemical carrier is evidence that the range of applications for KEL-F Dispersions is not limited by size, and that present techniques of dispersion coating can be applied to tanks and other outsize equipment. There are experienced applicators of KEL-F Dispersions, serving nearly every major industrial area. They can show you how this fluorocarbon polymer can come to your aid in your fight against corrosion and high processing temperatures. For more information, send for KEL-F Dispersion Manual, and list of applicators.

KELLOGG

THE M. W. KELLOGG COMPANY

Chemical Manufacturing Division, P. O. Box 469, Jersey City, N.J.

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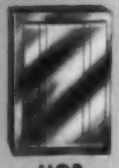
PENCIL CAVITIES HOBBED IN SOLID STEEL



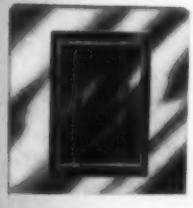
MOLDED PIECES | HOBBED CAVITY | HOBBED CAVITY CUTAWAY VIEW

SKILLED HANDS *AND* GIANT PRESSES

combine to turn out consistently accurate hobbed cavities



HOB



HOBBED CAVITY



HOB



HOBBED CAVITY

Of course, Newark Die Hobbing and Casting Co. operates a battery of high-capacity presses—up to 3,000 tons—for the making of hobbed cavities.

But even more important than the number and size of hobbing presses is the skill and experience of the craftsmen who operate them. Without this know-how, *a costly hob can be ruined in seconds!*

That is why the skill of Newark Die's craftsmen—men with up to 30 years of experience—is so important to users of hobbed cavities. Newark Die is prepared to make hobbings from your own hobs—or to design and construct the hobs for you.

NEWARK DIE HOBBING AND CASTING CO.

22 SCOTT STREET, NEWARK 2, N. J. • PHONE: MArket 2-3305

Comparison proves the Fellows "6-200" leads the

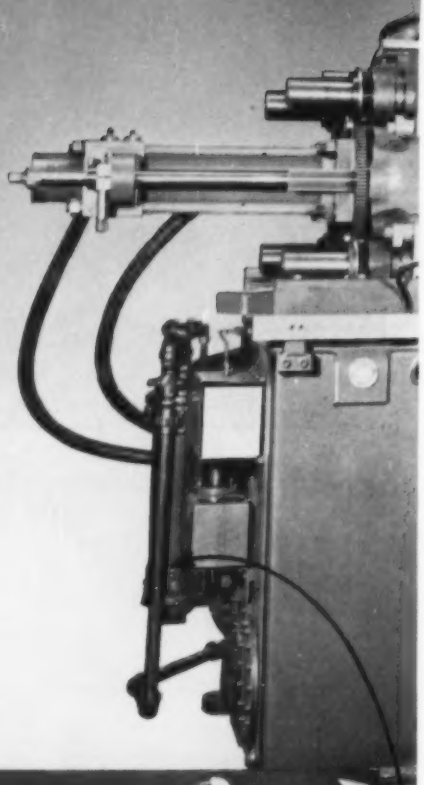
CAPACITY—The "6-200" is the fastest fully automatic FULL 6 OUNCE machine on the market! "Pre-Pack and Pre-Positioned" device (optional) brings plunger halfway forward during press dwell . . . providing up to 8 OUNCE "SHOTS."

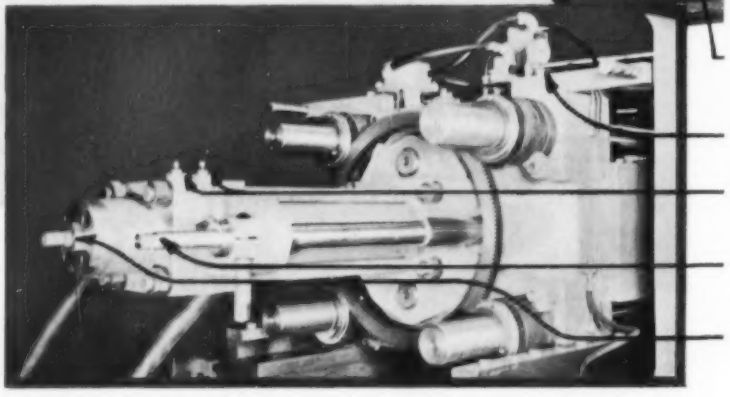
SPEED—Thanks to such features as variable stroke adjustment, rapid advance injection, and new, improved Speed-Flo heating cylinder . . . the "6-200" delivers "dry-run" speeds from 490 to 650 cycles per hour.

FULLY AUTOMATIC—Only the "6-200" gives you all the automatic features which allow one man to operate three or more machines! Grouped built-in temperature, injection pressure and speed controls! Counter, air-blast connections, alarm timer and safety device for mold . . . as extra equipment!

EASY SET-UP—Entire press hydraulically retracts from nozzle for purging . . . plenty of open space on all sides of die platen . . . mold opens 6 to 9 inches . . . single control clamping adjustment.

BONUS FEATURES—The "6-200" takes 12" x 24" molds horizontal, 15" x 21" vertical, 8" to 14" thick . . . hydraulic and electric interlocks on safety doors . . . plus many other exclusive Fellows features, shown at right.

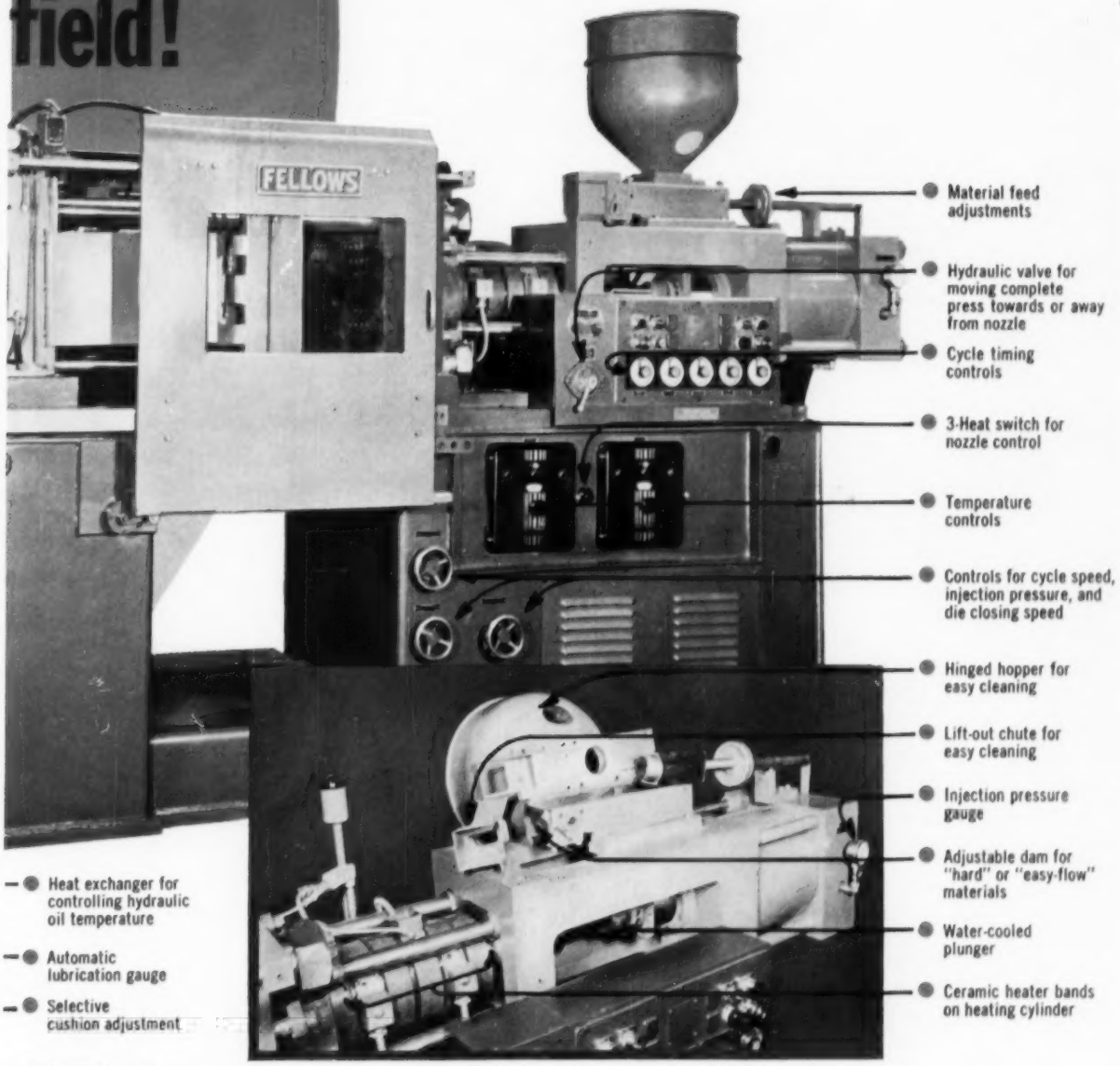




ASK your Fellows Representative for data about the complete line of Fellows Injection Molding Machines. He can also give you information on the Fellows Plan for deferred payment.

THE FELLOWS GEAR SHAPER COMPANY, Plastics Machine Division, Head Office and Export Dept., Springfield, Vt. Branch Offices: 319 Fisher

field!



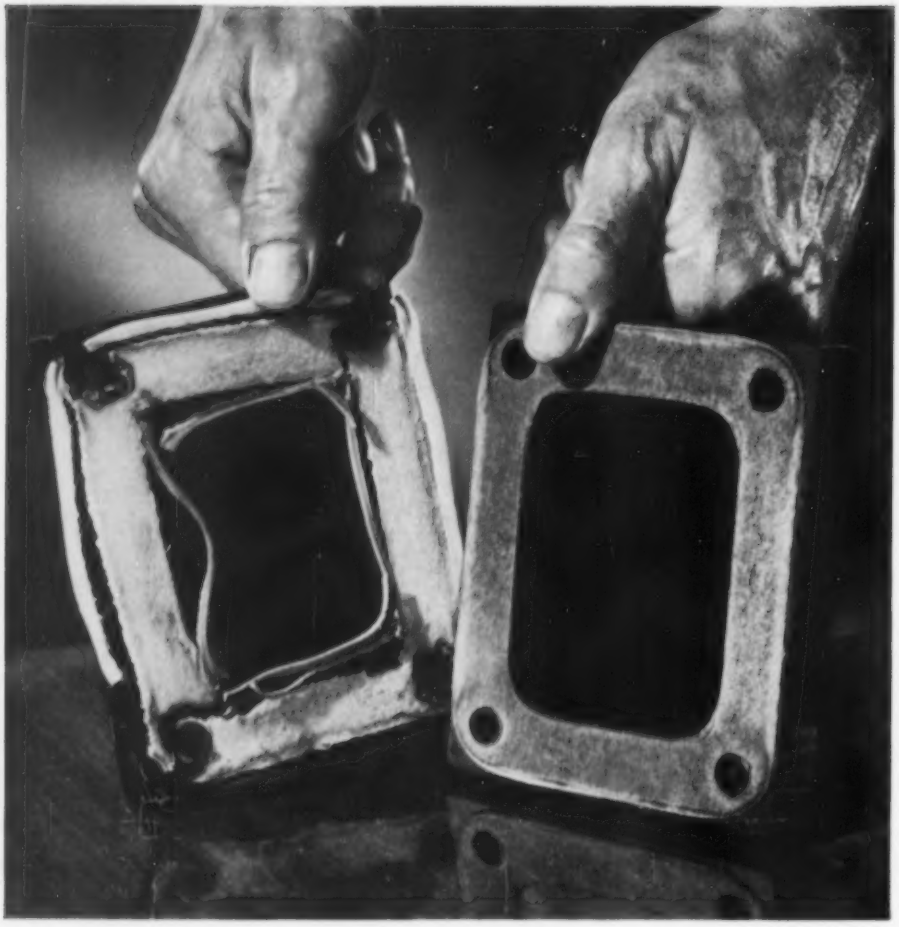
- Material feed adjustments
- Hydraulic valve for moving complete press towards or away from nozzle
- Cycle timing controls
- 3-Heat switch for nozzle control
- Temperature controls
- Controls for cycle speed, injection pressure, and die closing speed
- Hinged hopper for easy cleaning
- Lift-out chute for easy cleaning
- Injection pressure gauge
- Adjustable dam for "hard" or "easy-flow" materials
- Water-cooled plunger
- Ceramic heater bands on heating cylinder

- Heat exchanger for controlling hydraulic oil temperature
- Automatic lubrication gauge
- Selective cushion adjustment
- One point mold height adjustment
- Simple stroke length adjustment

Fellows

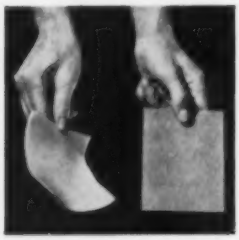
injection molding equipment

Bldg., Detroit 2—5835 W. North Ave., Chicago 39—2206 Empire State Bldg., New York 1—6214 West Manchester Avenue, Los Angeles 45



Cold flow resistance of TEFLON* and reinforced TEFLON (DUROID 5600) was tested at 700° F., under a torque of 35 pounds and a flange pressure of 1,000 p.s.i. After 2 hours the flanges were cooled and the bolts retightened. The flanges were then exposed to the heat for another 2 hours. Results are as pictured. The gasket of TEFLON (left) extruded extensively on all edges and lost all bolt torque. DUROID 5600 did not extrude and retained 15 pounds bolt torque, demonstrating significantly improved resistance to cold flow.

Greater Resistance to Heat Distortion



TEFLON (left) distorted badly when subjected to 720° F. and then cooled. Reinforced TEFLON (DUROID 5600) exposed simultaneously to the same temperature retained flatness, demonstrating greater dimensional stability at high temperatures.

SOME IMPORTANT TEST VALUES

Tensile Strength, MD, psi	2500
Tensile Strength, CMD, psi	1500
Compressibility, 5000 psi, %	8
Thermal Expansion Coefficient per °F., 73-140°F.	2.7×10^{-5}
Heat Distortion Temperature, °F.	
66 psi	500+
264 psi	500+
Deformation under Load, %	
1200 psi	2*
2000 psi	3*
Coefficient of friction against polished steel,	
static	.21
kinetic	.14
Specific Gravity	1.90

*Made up of actual flow and also of compression under load. Data to indicate breakdown between these two portions is being obtained.

ROGERS REINFORCES "TEFLON" TO REDUCE ITS COLD FLOW

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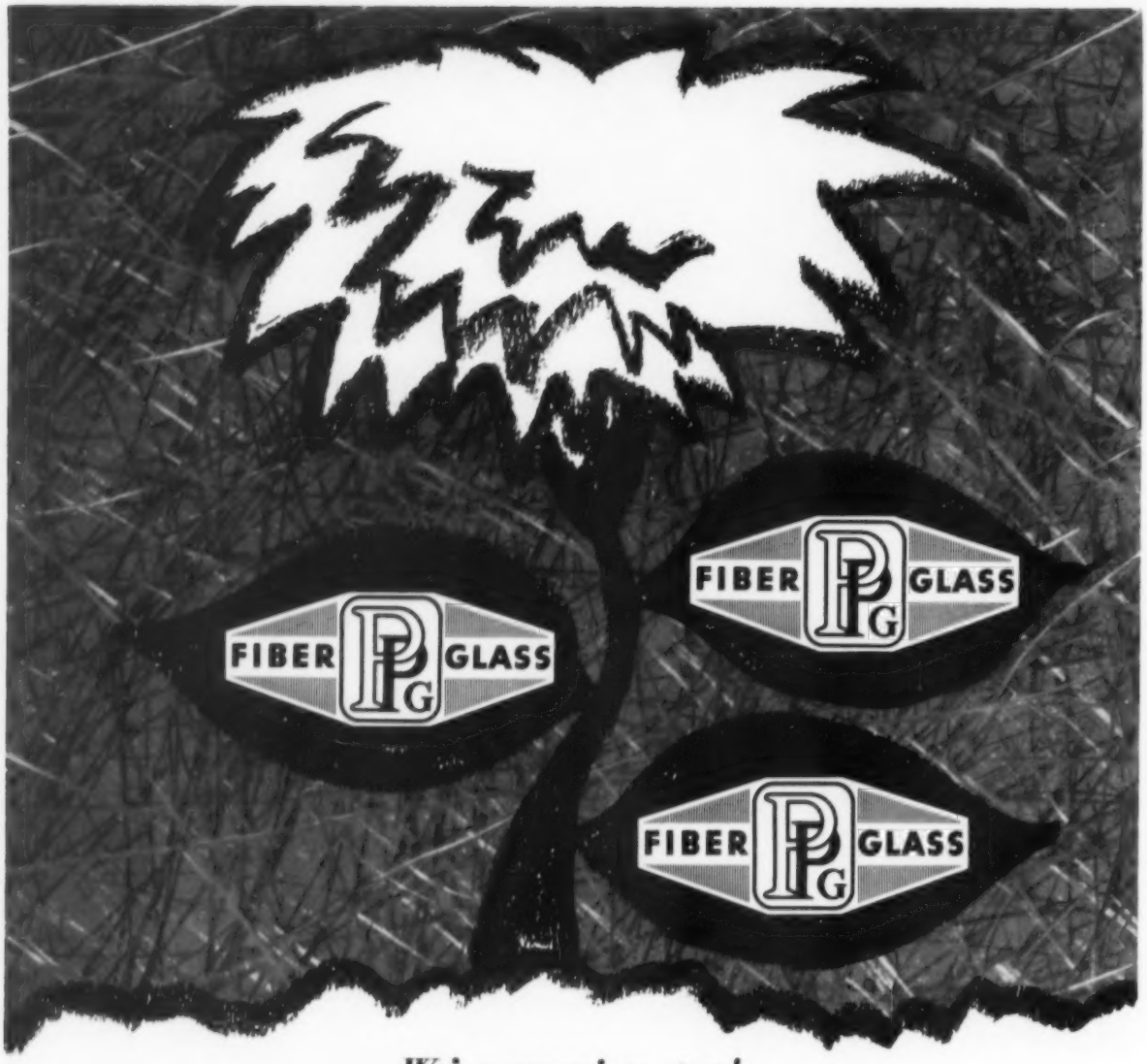
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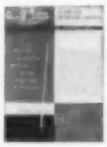


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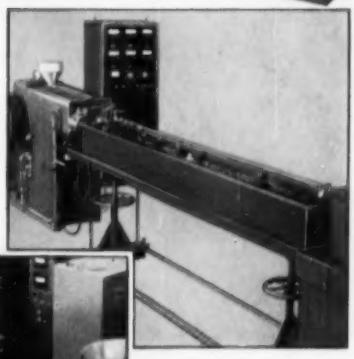
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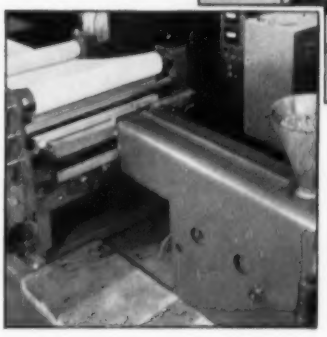
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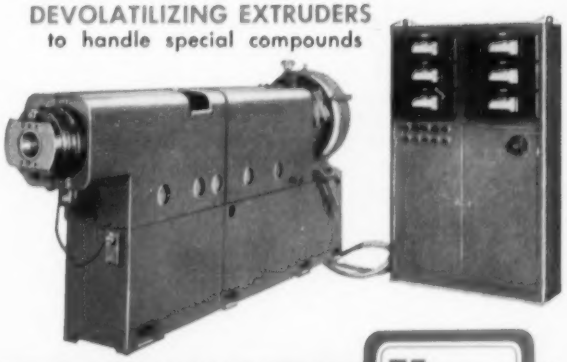
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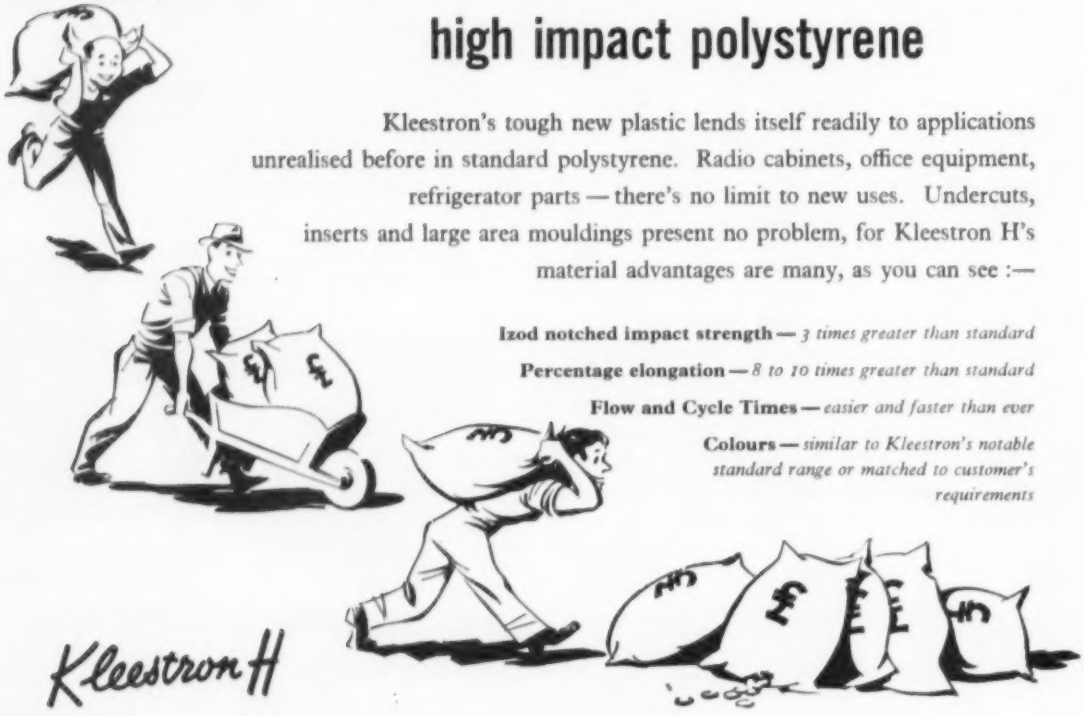
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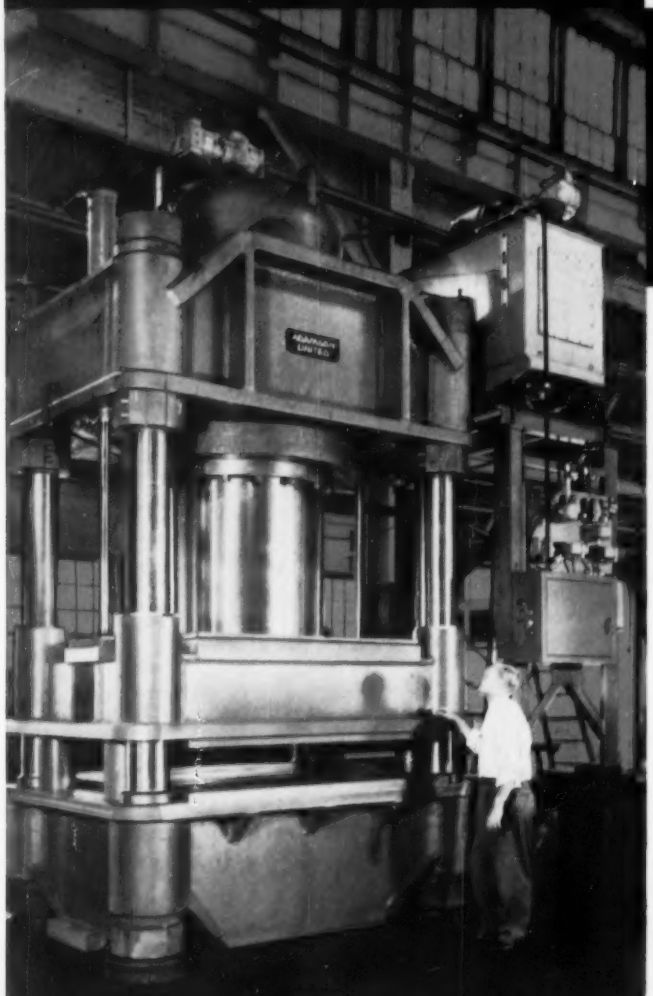
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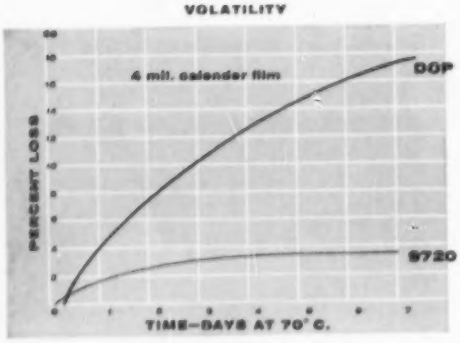
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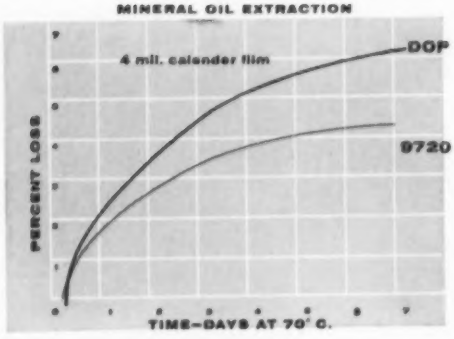
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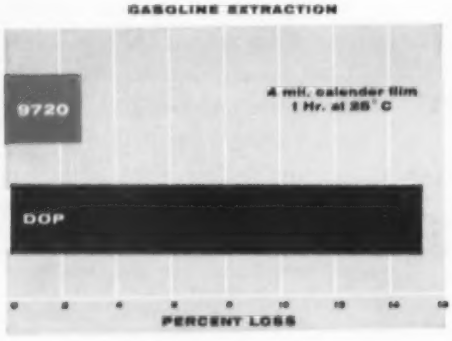
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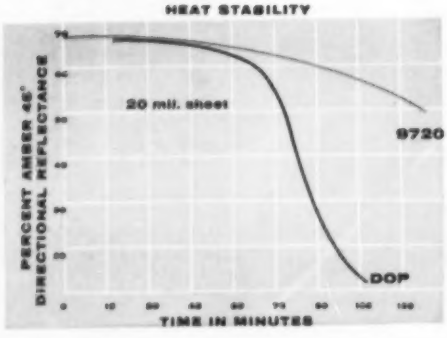
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MODERN PLASTICS

DECEMBER 1955 VOLUME 33 NUMBER 4

Whether shipping, storing,

or processing materials, manufacturers

LOOK TO PLASTICS LININGS

for adding new standards of

corrosion resistance, light weight, and

efficiency to design of tanks or containers



Chemically-inert liner fabricated of extruded thin-gage Kel-F film is easily slipped into cylindrical drum to protect the interior from corrosion

Courtesy The M. W. Kellogg Co.

IN TERMS of the protection, convenience, and economy afforded those engaged in the bulk packaging of foods, chemicals, and similar types of products, the value of molded, fabricated, or spray-on plastics linings for shipping containers of all types is inestimable. Equally as impressive is the role which the linings and interior coatings are playing in providing protection against corrosion for tanks, vats, and other processing and storage vessels.

Together, these two fields of use represent an important and rapidly growing outlet for a wide variety of plastics materials. The number of steel containers and drums used by industry each year, for example, runs well into the millions (estimated shipments of steel barrels, packages, kegs, and pails in the first half of 1955 totaled close to 66 million units). Similarly, fibre drums and corrugated shipping containers, both of which also represent markets for plastics, enjoy an annual production in the tens of millions of units. More important, from the standpoint of plastics usage, is the fact that of the many products packaged in the drums and corrugated shipping containers, food and chemicals—the two materials for which plastics linings and coatings are most applicable—account for some 30 to 40% of the total.

As far as tanks, vats, and other storage vessels are concerned, no attempt has ever been made to pin

down the exact number in use today. Suffice it to say that there are few major industries that do not make extensive use of this type of equipment—and even fewer for which the plastics linings and coatings cannot provide a solution to costly corrosion problems.

Wide Variety

Depending on the end-use application, plastics interior linings for shipping containers, tanks, or vats can take many forms. They can be fabricated of polyethylene, vinyl, Kel-F, or Teflon film; they can consist of plastics films laminated to aluminum foil, glass cloth, or other material; they can be produced in one piece by a combination of injection and blow molding; they can be fabricated of rigid vinyl or polyethylene sheet; or they can be supplied as a polyester resin-fibrous glass laminate. In the form of a liquid coating (usually either phenolic or vinyl), plastics can also be easily applied by brush, spray, or dip operations to the inside of tank or drum.

It should be pointed out that there are also many types of all-plastic carboys and heavy-duty shipping containers currently in use, as well as numerous types of processing tanks, vessels, and related equipment molded or fabricated entirely of plastics materials. Such applications, however, are beyond the scope of this article, which will be confined to tanks, drums, and related items wherein plastics are limited to an interior pouch, liner, or coating.

In contrast to all-plastics equipment, the plastics linings and coatings have no structural strength in and of themselves, but serve essentially as an internal sheath for a basic metal or fibre outer shell which gives the unit its essential form and physical strength. As such, their function is basic—namely, to protect the interior of the container or equipment against corrosion or chemical attack, or to guard the product itself against possible contamination.

Shipping Containers

As a market for plastics, shipping containers—running the gamut from corrugated fibre boxes to huge steel barrels and drums—are an important outlet. For this application, plastics linings and coatings can take several forms.

In its simplest version, the plastic liner may consist merely of a separate inner bag fabricated of plastic film which is placed in a metal or fibre drum or corrugated container and is supported by the walls of the outer container. Liners or pouches of this type, used by the millions each year, in addition to corrosion resistance, offer many advantages to shippers.

Shipping Costs

For one thing, spectacular savings in shipping costs frequently result when a lightweight drum or other type container with a plastic film liner is substituted for a heavy type shipping container. One interesting case history cited by a major producer of polyethylene film concerned a large shipper of bulk meat products in brine. By switching from the heavy container formerly used to a fibre drum containing a polyethylene film liner, this company obtained an average reduction of 66% in tare weight. On a typical shipment from Chicago to New York, involving 50 containers per car, the total saved per car was $105.84 (5400 lb. per car @ $1.96 per 100 pounds). This shipper reported annual savings of around $50,000 as a result of the switch to plastic film-lined containers.

When plastic film liners are used in various types of rigid shipping drums and containers, they facilitate emptying of highly viscous products which otherwise would adhere to the walls of the outer package. After contents have been poured from the







Photos courtesy The Visking Corp.

Polyethylene film to be used for lining steel drum is placed over special mandrel . . .

. . . Mandrel is then inverted and lowered into the drum, carrying the film liner with it . . .

. . . Product is next poured into polyethylene bag, which is held by special jig . . .





Photos courtesy The Visking Corp.

Beverage mix is filled directly into fibre drum lined with tough, moisture-resistant polyethylene film (above). Top of liner which was folded down over drum during filling is then twisted and tied with cord (right)

mouth of the opened bag, the bag may be lifted out of the container and folded down or "milked" until the material clinging to the walls has been dislodged and emptied out. Tests have shown, for example, that a supposedly "empty" metal drum used for shipping automobile undercoating actually retained 15% of the drum's capacity on the walls of the container and had to be scraped out—a problem easily solved by the use of a plastic liner.

In some instances, as in the shipping of dry products which do not cling to the plastic film, the liners may be removed from the container after emptying, folded compactly, and returned to the manufacturer for re-use, making further shipping economies possible.



. . . Cover (with polyethylene sheet beneath it) is placed over filled drum

Polyethylene Film

The majority of these liners are fabricated from polyethylene film, although other types of plastics materials are used to meet special packaging problems. Polyethylene's relatively low cost, its exceptional resistance to a wide range of chemicals, and its durability, coupled with the fact that it can be used in direct contact with food products and can easily be fabricated by heat sealing, are the factors that are largely responsible for its dominance in this particular field.

The wide range of products for which such plastic liners are now used is growing constantly. It includes many types of corrosive or otherwise hard-to-handle chemicals, ice cream mixes, adhesives, syrups, automotive undercoatings, frozen fruits, frozen cream, hydraulic fluids, various types of lubricants, animal sausage casings, and a host of other items. Many of these products are of such a nature that they would penetrate the walls of a fibre container or would attack the surface of a metal container. In other instances, the products are hygroscopic in nature and require a suitable barrier material, such as polyethylene, to protect them against moisture absorption. Even live tropical fish are now being successfully shipped in polyethylene bags filled with water and enclosed within a suitably reinforced corrugated shipping container.

Currently, one of the major outlets for polyethylene liners is found in the shipment of dry milk solids. For this purpose, 55-gal. steel or fibre drums are widely used. The liners guard the food product against contamination and prevent pickup of odors. The material's high degree of moisture-vapor-proofness also prevents pickup of moisture by the highly hygroscopic product, which would cause it to lump and stick together. Heavy-duty crinkled multiwall shipping bags having a removable polyethylene liner are also at present being used extensively in shipping this product.

Rochester Dairy Cooperative, Rochester, Minn., was one of those who recently discontinued the use of 10-gal. metal cans for its ice cream mix and ice milk mix in favor of 5-gal. corrugated cartons with polyethylene liners. The light weight of the new containers—47½ lb. against 115 lb., for the loaded 10-gal. cans—makes it much easier for Rochester customers to empty the product into counter or self-service machines. The new packages also require less



Courtesy Hinde & Dauch

Live fish in water are shipped in polyethylene bag placed in cardboard box



Courtesy Jones & Laughlin Steel Corp.

Semi-rigid, heavy-gage polyethylene liner is custom-fitted to drum size



Courtesy American Agile Corp.

Heat welding technique is used to fabricate polyethylene sheet tank lining

storage space, reduce spillage, and eliminate washing, storage, and handling of returns.

Inserting the Liner

Polyethylene film liners are available from numerous bag making firms and plastic film fabricators in both flat and gusseted styles, and in a wide range of sizes and thicknesses. To insert the liners in a drum, barrel, etc., prior to filling, a hollow mandrel or tube may be used. The liner is first slipped over the mandrel; then, the latter is inverted and lowered into the container. Next it is withdrawn, leaving the liner in position. The top edge of the liner may be folded down over the lip of the drum to facilitate filling. After filling, the liner is twisted at the top, tied together, and the twisted portion then allowed to unwind. This leaves sufficient head space in the top of the liner to prevent strains being imposed directly on the liner through movement of contents during shipment.

Heavy-Gage Liners

Much development work has been done on specialized types of plastics liners to increase their utility for various types of products. One such liner recently placed on the market is the Jasperdrum, developed by the Jasper Bag Co., Cleveland, Ohio. This liner, custom-made to each metal drum manufacturer's design, is produced from 6-mil Visqueen polyethylene film, which is about one-third quicker than the film normally used for such liners. Because it is form fitted, the Jasperdrum has no pleats and folds which might fracture as a result of shipping vibrations. Its flare style top is locked into the rim of the drum when the top is applied. When used in conjunction with a molded polyethylene retractable pouring spout, supplied by Rieke Metal Products Co., this plastic drum liner produces a sealed unit within the container which cannot be opened without breaking the seal, yet which can be closed if contents are not all used at once.

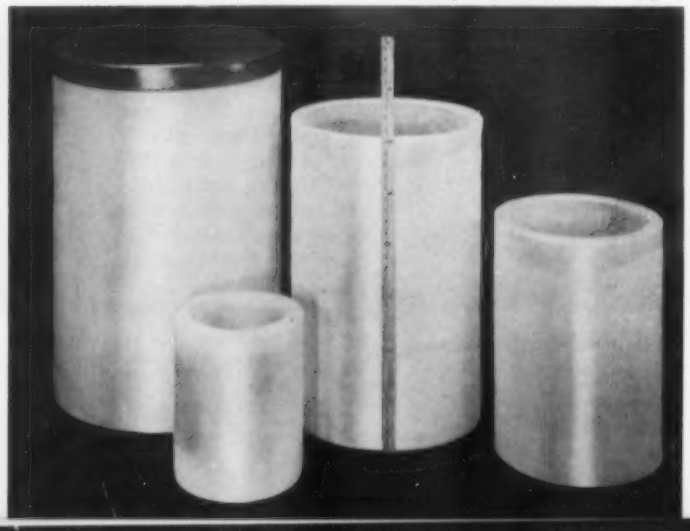
Another heavy-gage polyethylene film liner for steel containers now in production is the JaLiner, developed for national distribution by Jones & Laughlin Steel Corp. Designed to permit transportation of chemicals and other liquids at reduced costs, it is described as the first closed-top plastic liner for steel containers in which the liner is an integral part of the container and also the first liner of its type installed during container production.

The semi-rigid JaLiner is fabricated of heavy-gage polyethylene tubing and sheet which prevents collapse during pouring. Tin plate or polyethylene pouring spouts are available for use with the liner. Custom-tailored to fit the exact dimensions of the steel container, and electronically sealed together, the polyethylene JaLiner has already proved successful in field trials conducted for soft drink concentrates, photographic chemicals, pharmaceuticals, and germicides.

Denver Plastics, Inc., Golden, Colo., fabricates a 15-gal. polyethylene drum liner used as an insert in steel drums for transporting and storing corrosive chemicals. This liner, which recently received use approval from the Bureau of Explosives, consists of three pieces of

Where additional support is required, one-piece molded polyethylene tanks can also be used as corrosion-resistant liners for steel or plywood drums

Courtesy Delaware Barrel & Drum Co., Inc.



polyethylene sheet welded together. It uses a compression type closure rather than the typical screw-on thread cap. Such closures, it is claimed, are easier to use, permitting the liner to slip into the drum and preventing interference with the head fastening. These liners are used for shipping sulfuric, hydrochloric, and muriatic acid.

Protective Lining Corp., Brooklyn, N. Y., is another supplier of polyethylene film drum liners in gages of 1 to 20. The company has developed a special type of seal for the liners combining electronic and thermal sealing techniques which provides excellent protection against breakage. Liners are supplied both in conventional bag form or with round, flat bottoms that facilitate insertion and eliminate creasing when they are slipped into the drums.

For shipping applications involving acetic acid, various oils, or other products not compatible with polyethylene, the company makes available vinyl film liners in thicknesses of 4 to 20 gage.

Kel-F Liners

Polyethylene film is not the only material finding a ready market in drum and box linings. Chemically-inert drum liners of extruded Kel-F film are also now available to fit standard sizes of shipping containers. Fabricated by Electronic Wave Products, Inc., New York, N. Y., these liners permit storage or shipment of corrosive materials in ordinary steel or fibre drums without contamination. Since fluorocarbon material effectively resists dilute and concentrated mineral acids, alkalies, and corrosive pastes and solids, applications are virtually unlimited. Although the initial cost of the liners is higher than that of glass vessels, their light weight and unbreakability result in a cost advantage in shipping. As compared with alloy steel drums ordinarily used in handling fuming nitric acid, liners of Kel-F film cost but a fraction as much and their long life, without contaminating the product, gives them a decided advantage. In addition, the liners will not adhere to the drum, nor will the contents adhere to it, and they will not embrittle under continuous re-use or aging.

These liners, which can be made in any shape and size, are now available in "peel-over" and "tie-off" types for 5-, 15-, and 55-gal. drums. They are fabricated from 0.005-in. extruded Kel-F film.

Another lining material taking advantage of the specialized properties of the fluorocarbons, combines a Kel-F surface coating with a 3-mil aluminum foil backing. Developed by Joclin Mfg. Co., North Haven, Conn., and known as Fluorolin 202, the material is spread-coated on the foil side with a pressure-sensitive adhesive that enables users of metal containers to make their own corrosion-resistant liners to fit a wide range of container sizes and shapes. According to the manufacturer, the material can be cut out, assembled on the job, and pressed into place like wallpaper, using only a straight edge and shears. Joints may be butted and sealed with strips of the same material.

In another version of the lining supplied by Joclin, Teflon is bonded to the aluminum foil.

Both materials are inert to virtu-



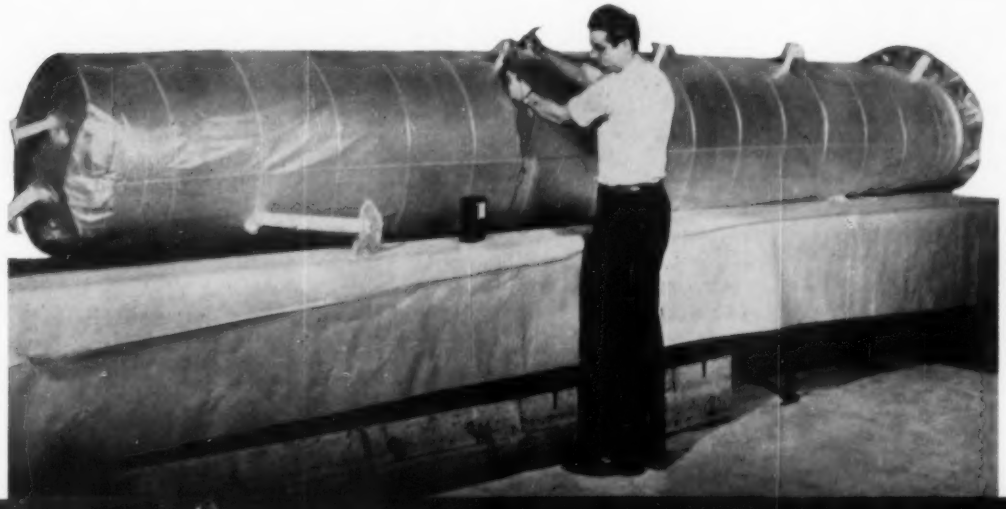
Photos courtesy U. S. Stoneware Co.

Press-polished vinyl sheets are laid up on cement-coated walls of metal tank (above). To form continuous lining, extruded vinyl strips are applied over joints with special cementing and heat sealing techniques



Vessel lining (shown inflated) intended for use in fractionating tower handling highly corrosive hydrofluoric acid is fabricated of 0.005 in. thick Kel-F film

Courtesy The M. W. Kellogg Co.





Courtesy Kaykor Industries, Inc., Div. of Kay-Tex Mfg. Corp.

Hot air-welded joints of vinyl sheet tank lining are tested for porosity with electric spark tester at 15,000 volts

Despite the size of the storage tank illustrated below, vinyl sheet lining can be easily and economically applied to the inside of the tank

Courtesy Atlas Mineral Products Co.



ally any type of chemical attack and are also anti-fouling in contact with even the most viscous liquids.

Molded Liners

Not all plastic shipping drum liners are fabricated from film. Heavy-duty polyethylene drum liners supplied by Delaware Barrel & Drum Co., Wilmington, Del., for example, are produced in one piece by a combination of injection and blow molding. The self-supporting one-piece polyethylene drum liners, ICC approved for shipment of regulated and non-regulated products, are jacketed in steel drums for commercial shipment. In production for more than two years, they have become a standard package throughout the country. Available in 5-, 15-, 30-, and 55-gal. sizes, the polyethylene drums are tailored to fit into standard steel drums, steel pails, or corrugated cartons. The polyethylene units, in their steel overpack, have been classified by the ICC, affording the lowest freight rates on shipments and return of empties.

These molded polyethylene drums are made with two heavy-duty flanges, having standard threaded openings to accommodate the 2-in. and ¾-in. polyethylene drum plugs. Outer surfaces of the flanges are made with heavy-duty threads accommodating standard metal, phenolic, or polyethylene screw caps. Caps, which can effect a primary or secondary seal, are sufficiently economical to be expendable.

Tanks and Vessels

As with linings for shipping containers, the plastics interiors for storage tanks, processing vessels, and similar structures take a number of forms, can be manufactured in several different ways, and are equally diverse in methods of installation. They may be applied, for example, in the form of a unified, prefabricated unit which is merely fitted inside the basic container to provide protection against corrosion or chemical attack; in other cases, sheet material or laminates may be used to build up a plastic lining inside the container; and in still other cases, depending upon such factors as the shape and size of the container itself and the nature of the product involved, the plastics linings may be applied by brush, spray, etc., in the form of a coating.

Regardless of the application method or the specific plastic involved, however, linings for tanks or processing vessels serve a basic function—protection against corrosion. As such, they have found their largest volume use in the chemical, petroleum, food processing, beverage, electroplating, and related fields, where they permit the use of comparatively inexpensive processing or storage equipment to replace those fabricated of costly alloys.

In addition, properly selected plastic coatings and linings also guard against product contamination and keep product wastage during processing to a minimum—a very important consideration when dealing with pharmaceuticals and other expensive products. Thus, a lining of extremely low surface tension may permit more thorough product recovery.

Coatings or Linings

The determination of what type of lining to use and its proper application constitute a highly specialized field of activity. Properly chosen materials and experienced application are very important.

Protective sheaths for the interior of processing and storage tanks or vessels fall into two categories—linings and coatings. The difference between a coating and a lining is primarily a matter of thickness. According to Dr. Raymond B. Seymour, executive vice-president and technical director of Atlas Mineral Products Co., Mertztown, Pa., one of the pioneers in the field, most in-

dustrial protective coatings range from 5 to 20 mils in thickness, while linings are usually from 100 to 250 mils thick. In some instances, multiple coats of a protective coating may be applied to produce a serviceable lining. Laboratory tests have shown that protective coatings, applied under ideal conditions, are adequate as linings. However, as stated by Dr. Seymour, "since it is almost impossible to secure ideal conditions, a sizable factor of safety must be present to compensate for unavoidable application errors."

Some types of plastic tank liners are more susceptible than others to mechanical damage or damage resulting from high processing temperatures. If the surface of the lining is broken at any point, corrosive materials will come into contact with the vessel wall, defeating the essential function of the lining. Thus, linings must sometimes be protected against abrasive or accidental damage. Since structural breakdown due to high temperature is a common cause of lining failures (resistance to the corrosive action of most chemicals decreases as the temperature rises), an adequate temperature differential may be provided at the higher temperatures by means of brick sheathing.



Courtesy Joclin Mfg. Co.

Kel-F-aluminum foil laminate liner has a pressure-sensitive adhesive backing

Rigid Vinyl Sheet

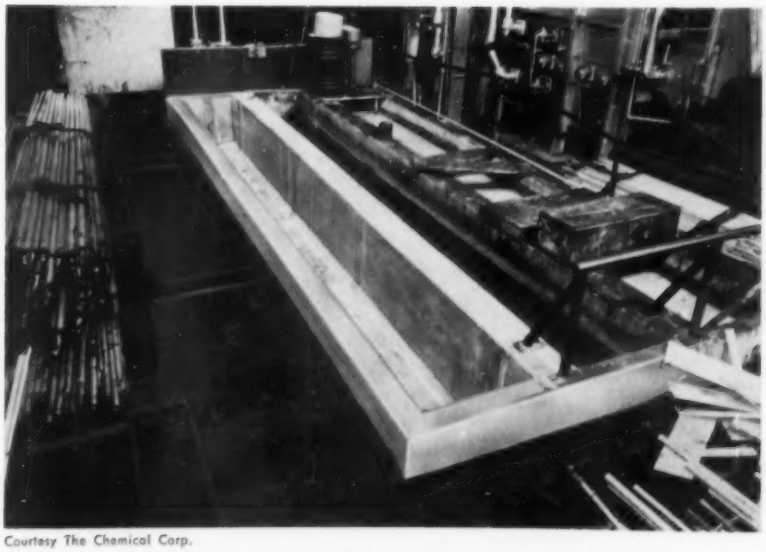
The plastics materials most widely used in the form of rigid sheet or fabricated corrosion-resistant tank linings for existing equipment include rigid vinyl, polyethylene, and polyester-fibrous glass laminates.

Several companies supply unplasticized vinyl chloride sheet material up to 3/16 in. thick (or thicker, if necessary) for use as tank linings. Highly resistant to both acids and alkalies at temperatures as high as 170 to 190° F. such linings are customarily applied in the supplier's plant, in the shops of licensed applicators or, if necessary, in the field. The smooth, tough, flexible, resilient and abrasion-resistant, press-polished sheets are also non-contaminating, non-oxidizing, and have excellent dielectric properties. The material's resistance to corrosive media in many cases is reported to surpass that of high grade steels and non-ferrous metals.

The hot gas welding technique, which produces joints virtually as strong as the plastic material itself, is used extensively in fabricating rigid polyvinyl chloride sheets into tank liners and related items. The sheets may also be joined by cementing or both welding and cementing techniques may be used together in applications requiring completely pressure-tight joints. When the material is used for steel or concrete tank liners, a corrosion-resistant thermoplastic material may be applied to compensate for the thermal expansion differential.

A specialized type of laminate is also available from Kaykor Industries, Inc., Yardville, N. J., to overcome some of the principal problems involved in joining rigid polyvinyl chloride sheet to the interior of metal tanks. In previous applications, it had been necessary to build virtually a self-supporting rigid vinyl tank within the metal tank, utilizing sheet material rang-

(*To page* 202)



Courtesy The Chemical Corp.

Rugged liner for trough used in acid cleaning process is made up of molded reinforced plastics panels joined with strips of polyester-impregnated glass cloth



Courtesy A & P Finishing & Mfg. Co.

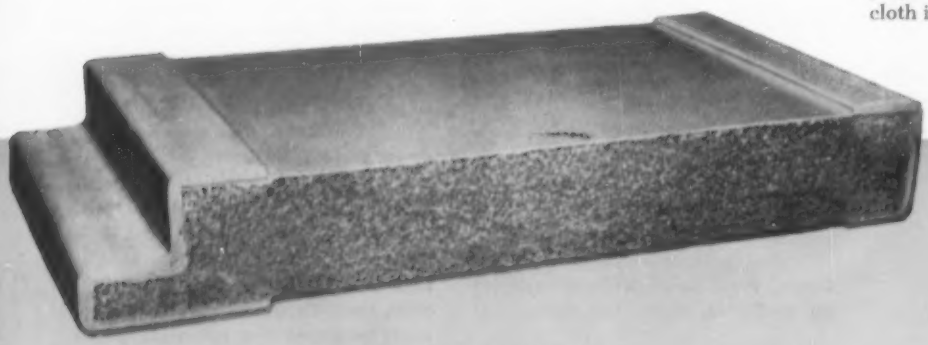
Low-cost wood or metal tanks coated with plastics offer same corrosion resistance as tanks made of expensive alloys

New Approach to Plastics Structures

Foam-core sandwich panels, reinforced plastics profile members, and specialized adhesives offer unusual design opportunities

LIGHT WEIGHT, unusual structural strength, and excellent thermal insulating properties, supplemented by a number of other desirable characteristics, are among the attributes of a newly developed type of sandwich construction. Now being produced under the name of Hasko-Struct, by Haskelite Mfg. Corp., Grand Rapids, Mich., the panel consists of self-extinguishing Styrofoam core having a facing of fibrous glass-reinforced fire-retardant polyester sheet. Available in a variety of thicknesses and sizes, the panel may find application in transportation, construction, cold storage, etc.

The foamed styrene core of the moistureproof, corrosion-resistant panels, has a density of 2 lb./cu. ft. or higher; the facings are made of polyester-impregnated fibrous glass cloth in thicknesses of 0.018 and 0.032



Sandwich structure consists of foamed styrene core and polyester-glass skins; fabricating shapes at either end are also of polyester-glass



All photos courtesy Haskelite Mfg. Corp.

Refrigerated truck with magnesium body has interior surfaces (side and end panels, roof, and door) lined with 3 in. thick plastics sandwich

Inside view of refrigerated truck. Sandwich panels are secured to walls by means of special, adhesive-coated clips



inch. Standard panel thicknesses are 1, 2, 3, 4, and 6 in., with special panels running as thick as 8 in. if required. Standard width of the panels is 48 in.; they are available in 96-, 120-, and 144-in. lengths.

At present, Hasko-Struct is supplied with an integrated surface of opaque white woven pattern of smooth texture, bonded to Styrofoam No. 33 as furnished by The Dow Chemical Co. Development work is also proceeding on colored face sheets and basic colors will be made available for special applications in quantity lots. Currently, it is not practical to produce small-production runs of colored material.

Continuous Process

The Hasko-Struct panels are produced by a continuous laminating process in which the Styrofoam cores are made up into stock-size sheets and the polyester-glass laminate is applied to the core with resin type adhesives, using controlled degrees of temperature and pressure levels.

The application range of the panels is greatly increased through a related group of polyester-glass continuous shapes (strips, angles, channels, jambs, etc.) known as Hasko-Mold, which are used in fabricating finished structures and components. The shapes, made with the same integrated surface as the panels, are supplied in opaque white. For bonding, sealing, and assembly fabrication of the various panels and shapes, a complete family of Hasko-Bond adhesives has been developed. These include various formulations, each with special characteristics for bonding channels, filling joints, and handling rapid patching and repairing applications.

Both the panels and the fabricating shapes used in conjunction with them may be easily machined, drilled, sawed, or routed with standard cutting tools. In addition to the specialized adhesives and structural shapes available, screws, bolts, nails, batten strips, and other types of fastening devices may be used in combining the components, depending upon the design and end-use.

Shelf Life

The plastic bond used with the Haskelite components is at the present time made of five basic resin formulations to give the user a greater flexibility in the fabrications. All bonds have a long shelf life.

No. 1 Hasko-Bond is a contact-

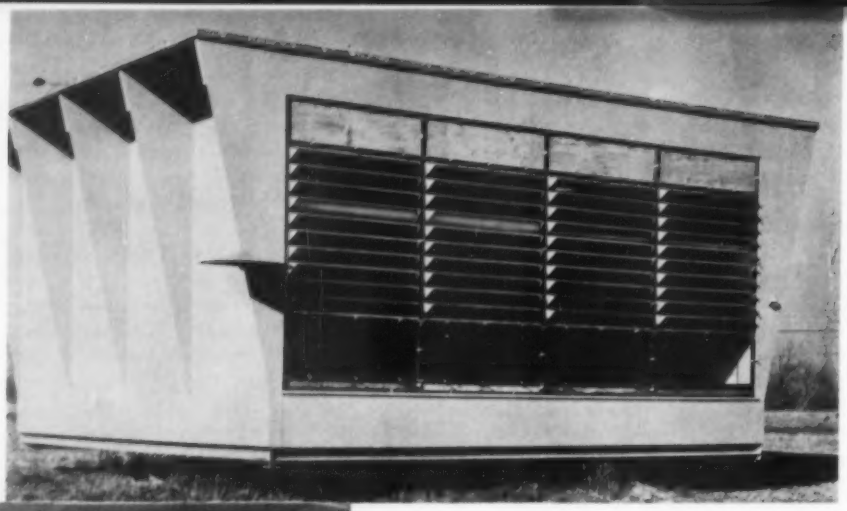
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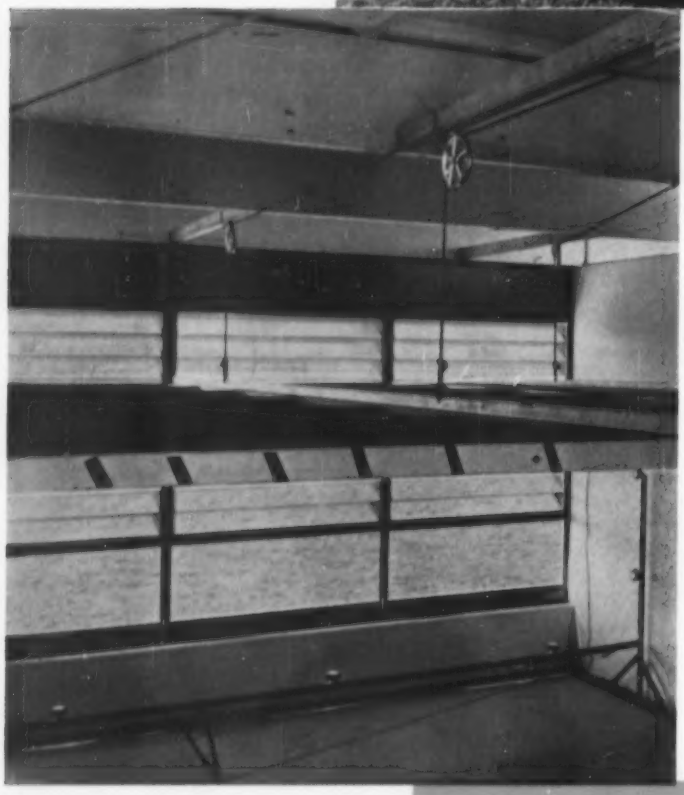


Good structural strength and insulating properties of sandwich panels are used to advantage in construction of refrigerated room

Freezer door, 60 by 84 by 6 in., is fabricated of sandwich panel consisting of styrene foam core and reinforced plastics skins



Exterior view of daylight control test building in which acrylic louver panels are installed for study. Exposed and hooded photocells at corners of building measure the total illumination on the windows and the ground-reflected light, respectively

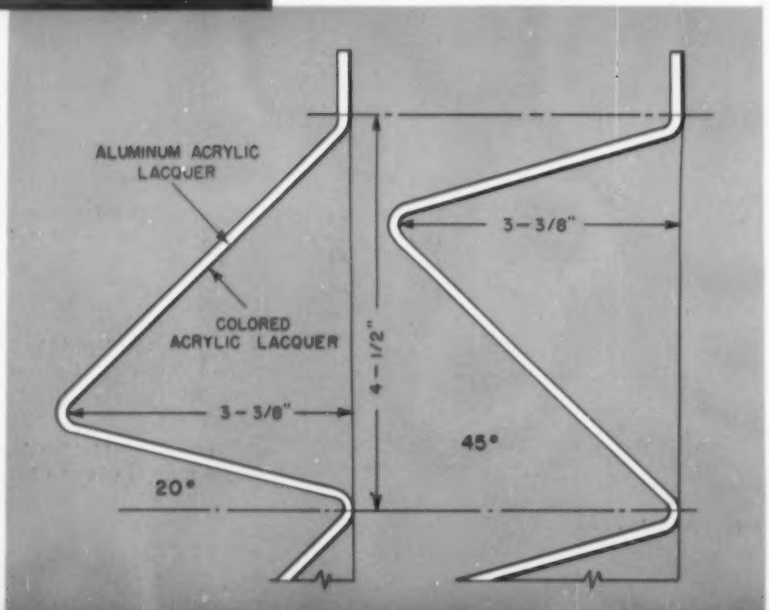


Interior view of daylight control test building. Ceiling is adjustable by pulley arrangement. Photocells above floor measure effectiveness of panels in daylight control

ACRYLIC panels for window glazing, formed and painted to provide "light-control" louvers, are a new approach to a planned daylighting system for building interiors. Schoolrooms have been the first to benefit. Offices, public buildings, laboratories, and factories are obvious applications for the material as practical knowledge accumulates; private residential adaptations make equally good sense, when mass production reduces cost.

The louver wall panel concept is actually a combination which, in one

PLANNED



Diagrams of typical acrylic louver panels, showing dimensions and angles. Daylight enters through unpainted portions of louvers. Painted undersides minimize glare (acrylic lacquer) and provide maximum reflection (aluminum-acrylic lacquer)

continuous surface, serves three purposes which are inherent to practically all window areas: 1) weather closure; 2) light transmission; 3) light control. To these purposes, acrylic sheet brings desirable properties: 1) weather resistance; 2) excellent transparency; 3) ease of forming, color range, and ready acceptance of paint or lacquer.

Basic to planned daylighting are the interrelated problems of admitting a maximum amount of exterior light yet shielding from direct sun and sky glare without impairing diffusion of light throughout the room area. Curtains, window shades, drapes, frosted glass, building overhangs, venetian blinds (interior louvers), and exterior louvers are all attempts at achieving these ends. Some of them reduce glare but at the sacrifice of adequate light; others do not control glare sufficiently; still others require frequent adjustment to be effective.

Louvers are Windows

The new acrylic louver wall panels are neither exterior nor interior accessories. They are actually the windows themselves. The transparent Plexiglas acrylic sheet is formed in a series of uniform ridges, the upper surfaces of which might be likened to the slats of a venetian blind, with the lower surfaces corresponding to the light-admitting areas. The inner surfaces of the "slats" are made opaque by spraying with colored acrylic lacquer. Thus the panel serves as a weather closure (because it is in a single piece), admits light (through the unpainted lower surfaces of the louvers), and controls glare (because of the painted slat surfaces).

It would seem obvious that, because the acrylic louvers are not adjustable, the angle formed between the painted slats of the louvers and the clear areas in-between would have to be determined by the geographical latitude in which the panels are to be used and the amount of daylight control desired in summer and in winter. However, research at Rohm & Haas Co., Philadelphia, Pa., where the louver wall panels were developed, suggests that these considerations are important only in relation to louver panels intended for seasonal control of solar heating and that "20° louvers will prove to be useful on all orientations at all latitudes for daylight control in school rooms and similar areas where a visual environment of high quality should be maintained."

Rotating Research Building

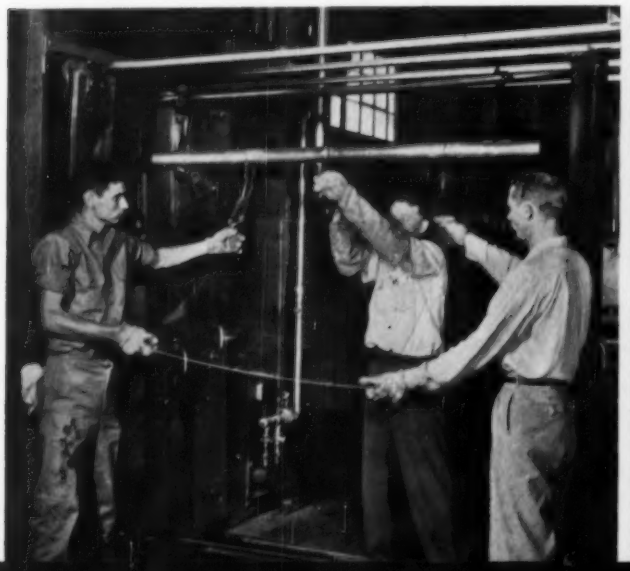
In the Rohm & Haas research program, a small building was erected on a turntable so that the structure could be rotated at will and the effectiveness of louver wall panels studied under varying conditions of sunlight and building orientation. One wall of the building is provided with adjustable framing and spring holding clips so that panels can be readily interchanged to determine effectiveness of various designs.

Photocells on the outside of the building measure the intensity of direct sunlight and of light reflected from the ground. Inside, other photocells are mounted on a movable framework and on the walls so that light-intensity data can be continuously recorded and correlated. With this set-up, experimental panels with different louver angles, various transparencies, and changed color schemes in the painted areas can be readily subjected to controlled study.

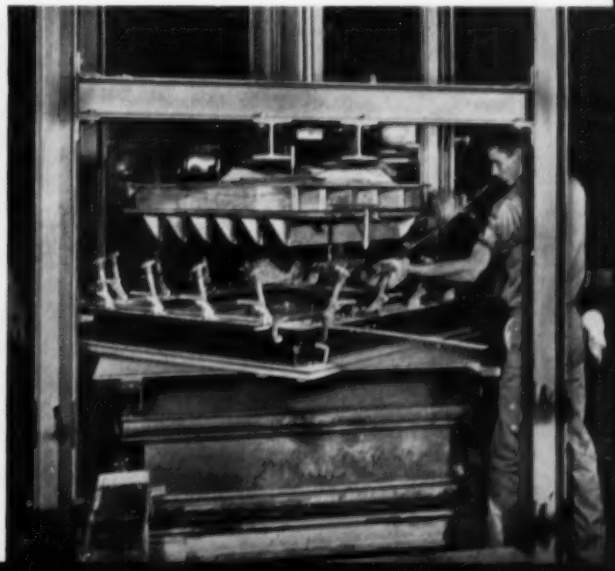
One product of this work has been to focus attention on the importance

DAYLIGHTING is now possible through the use of louvered transparent plastic panels

First step in producing louver panels is heating of acrylic sheet of proper size. Here workmen are removing a heated sheet from conveyor



The heated sheet is then placed in a single ridge-forming mold, built with staggered opposing members in each of its halves



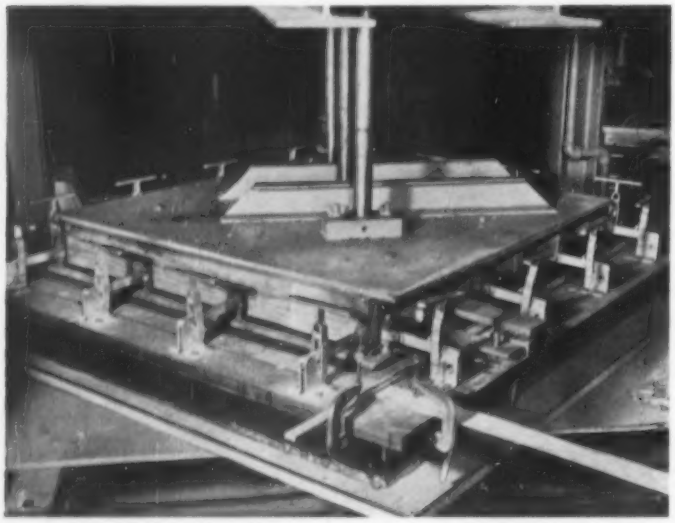
to planned daylighting of the light which is reflected from the areas surrounding the building and which enters the interior through the unpainted louver strips. It is pointed out that the architect, by the exterior use of materials having high reflecting properties, can provide substantially increased levels of indoor illumination.

Fabricating the Panels

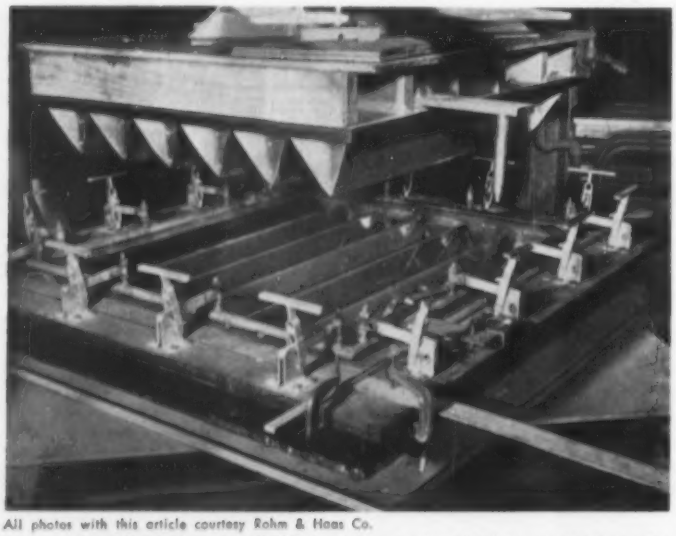
Thus far, louver wall panels are being produced in simple ridge-forming molds in which a heated Plexiglas acrylic sheet is placed and formed by staggered opposing members in the two halves of the mold. In some cases, a vacuum assist is used. The finished panel has a flat flange formed around all four sides for mounting it in position.

After the formed panel has cooled, the appropriate slats are sprayed with a coat of aluminum lacquer, followed by a second coat of colored lacquer. The color usually recommended is a pale green—called a "sight saving" color—but the second coat can be modified to blend with interior color schemes.

While sheet-forming is the simplest and quickest method of getting louver wall panels into production, the potential market appears to be big enough to challenge both forward-thinking injection molders and extruders. Injection molded panels, either painted as are the formed units or produced by some adaptation of the two-shot, two-color molding process, are a possibility. Continuously extruded sections, again either painted or produced by two extruders feeding a single die, might also conceivably enter the picture.



With the heated sheet in position, the mold is closed to form the louver panel. A vacuum assist is sometimes used to good effect in this operation



All photos with this article courtesy Rohm & Haas Co.

At end of molding cycle, upper half of mold is raised; molded louver panel remains in bottom half. Flange around edges of panel will be used to mount it in place

Heat Control

Problems other than light control crop up in connection with large window walls. One is heat loss during cold weather. A second is solar heat gain during summer months. To offset heat loss in areas where double-glazing is now an established practice, the louver wall panels can readily be combined with a flat acrylic sheet inside the louver panel. Perhaps even more important to the architect is the fact that the acrylic louvers hold down the incidence of solar heat gain in hot weather by reflecting a substantial part of direct and sky-reflected radiation from the sun.

Installation

Louver wall panels can be installed in standard wood or metal frames, with due allowance for normal thermal expansion and contraction. A continuous wood or metal bead should be used to retain the panel in the frame and a non-hardening, non-staining caulking mastic is recommended as a weather sealant.

When properly installed in schools, factories, offices, etc., louver wall panels can show direct benefits in glare reduction, light diffusion, and control of solar heat gain.

CREDITS: It is reported that the following fabricators have tooled up to manufacture louvered plastic panels, or are in the process of doing so: Amplex Mfg. Co., Phildelphia, Pa., Arrem Plastics, Inc., Chicago, Ill., Bettcher Plastics Co., Portland, Ore., By-Products Co., Bladensburg, Md., Colonial Plastics Corp., Newark, N. J., L. A. Darling Co., Coldwater, Mich., Holiday Plastics, Inc., Kansas City, Mo., The Kawneer Co., Niles, Mich., Luria-Cournand, Inc., Havre De Grace, Md., Pearson-Berlinghof, Inc., Newtown, Pa., Plastic Engineering Co., Houston, Tex., Plastic Products of Texas, Dallas, Tex., Plasticraft, Inc., Denver, Colo., Southwestern Plastics Co., Houston, Tex.



Courtesy Angelique

Luxury appearance and pleasant feel of molded melamine container enhance value of all-plastics push-button aerosol designed for dispensing perfume

Activator button and overcap are molded of polyethylene. Activator button is friction-fit and can be removed by retail clerk to prevent customers from sampling contents of aerosol container



And now—

ALL-PLASTICS AEROSOLS

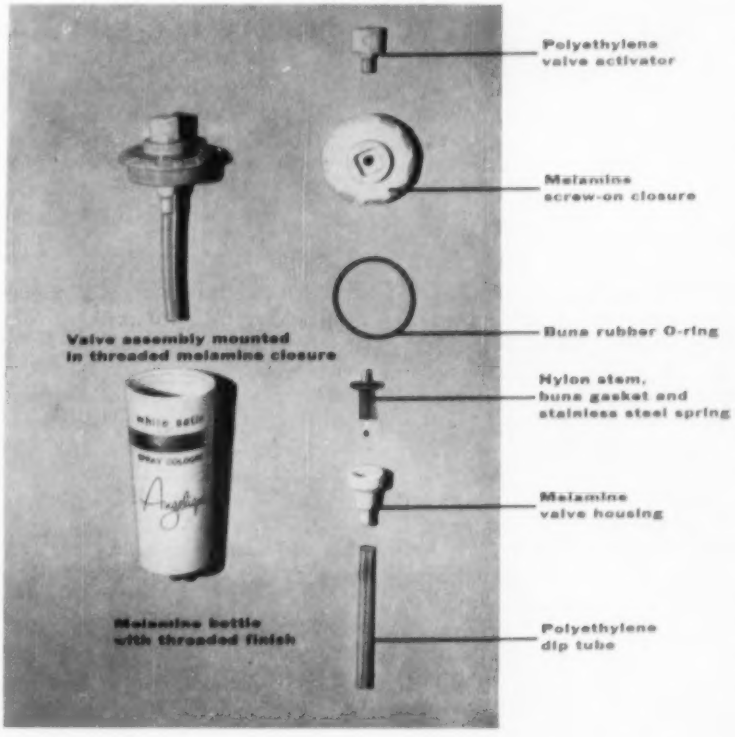
Melamine, polyethylene, and nylon are used to advantage in a new package making a bid for the competitive cosmetics market

IN WHAT promises to be the initial step in the development of a new and exciting market for plastics materials, the first all-plastics aerosol package has finally made an auspicious debut in the cosmetics and toiletries field.

Designed around an attractive basic container molded of melamine and utilizing component parts of melamine, polyethylene, and nylon, the new package, as far as is known, is the first of the many types of plastics aerosols currently being researched to be put into actual commercial production. There are reported to be still some minor bugs in the package that have to be ironed out, but the very fact that an all-plastics aerosol does exist and is commercially feasible may be the opening wedge needed to crack the lucrative market.

The three basic advantages of the new dispenser, which is being used by Angelique, Wilton, Conn., for packaging colognes, are: durability, design potential coupled with the wide range of colors available, and resistance to alcohols, acids, alkalies, petroleum products, and organic solvents. Where conventional glass containers are limited in design potential because of the fragile nature of the material, the high impact

(*To page* 224)



Special properties of each plastic determined final design of aerosol. Only metal component is stainless steel spring







Photos courtesy Fiberglass-Evercoat Co.

1 Damaged fender area is covered with coat of primer that acts as binder

2 Section of glass cloth, laid up on partly filled dent, is saturated with resin

3 After overnight hardening, patch is sanded down to blend with car body contours

Patch it With Plastics

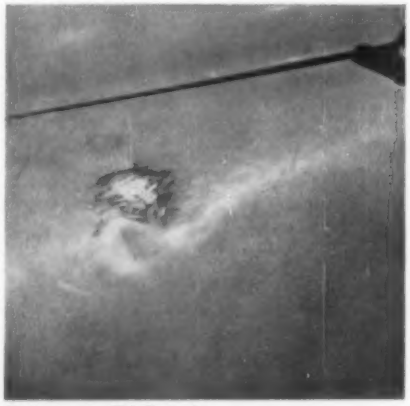
Available in convenient kit form, plastics materials are used for low-cost repairs on metal, reinforced plastic, wood, and concrete products

VARIOUS plastic-metal "cold solders" and various combinations of plastics resins with fibrous glass cloth or mat are being put to use today in a form of "plastic surgery" designed to give a new lease on life to torn, dented, or rusted-out body sections of automobiles. More important, the success of these plastics materials in automotive repair work has also stimulated an increased awareness of the quality patching jobs which they can do in other fields.

As evidenced by the growing number of specialized patching compounds and repair kits now reaching the market, the plastics materials can be used to improve the appearance and prolong the service life of many types of metal goods other than automobiles. Nor are they limited to salvage work on metal alone. Wood, concrete, china, and fibrous glass laminates also lend themselves to effective patching with plastics.

The plastics materials involved in this type of repair work fall into two general categories. One group consists of various plastics resins, such as epoxy or polyamide, combined with finely divided metals and other selected fillers to make a "cold solder" type of product that can be applied and molded like putty to the surface being repaired. The other, consisting of fibrous glass cloth or mat in combination with selected resins—usually polyester or epoxy—

EPOXY RESIN-



Photos courtesy Kish Resin, Inc.

1 Damaged automobile fender, showing dent and scratches surrounding it

LAMINATE KIT



4 Final step in repair, after sanding and painting, is polishing of patched section

has broad utility, being adaptable to the repair of either metal or reinforced plastics structures as well as wooden boats, rotted-out wooden window sills, leaking concrete foundation walls, and many other end-products.

Many Advantages

There are several reasons for the steadily increasing popularity of plastics materials for repair jobs. The development of new types of resins and resin-filler combinations which may be successfully used by even unskilled workers without elaborate tools or other equipment, has been a basic factor. Equally important is the fact that with these materials, rapid and inexpensive repairs may be made which would be difficult or impossible to accomplish with other repair techniques. In addition, repairs made with plastics materials have unusually good weathering properties, are resistant to rust and corrosion, and, from the standpoint of durability and appearance, are far superior in many respects to repair jobs accomplished with conventional materials.

Because of the simplicity of application, the use of plastics is not confined to professional auto body and fender repair shops or industrial plants. Automobile owners who prefer to do such work themselves can now obtain inexpensive kits containing all necessary materials, along with detailed instructions, to handle a variety of body repairs which previously few amateurs would dare to tackle. In addition, car owners can also use the kits to try some "customizing" on the body of the auto—adding a hood air-scoop or modernistic tail fins to give the family car a more distinctive appearance.

Fibrous Glass Laminate

As illustrated by photos at top, repairing a product by using fibrous glass cloth or mat in combination with plastics resins is a relatively simple job. In addition to conventional auto body repair jobs, this type of repair is particularly useful for mending rusted or perforated automobile gas tanks, since it eliminates the possibility of fire or explosion—hazards that must be guarded against when welding or soldering. In such cases, the area around the break is simply cleaned, covered with a resin-catalyst mixture, and overlaid with several thicknesses or resin-impregnated fibrous glass cloth.

Among the many other metal items which may be successfully repaired with polyester resin-fibrous glass patch kits are gutters and downspouts, metal boat hulls, and various sizes and types of piping. The same materials may also be used to seal cracks and leaks in concrete foundation walls. Another outlet is in the complete or partial coverage of wooden boat hulls to seal existing leaks or to make the hulls more durable and more water resistant (see "Old Boats Made New," MODERN PLASTICS *30*, 95, May 1953).

For fast, inexpensive repairing of reinforced plastic car and truck bodies, the kits have had considerable success. United Parcel Service, for example, reports a repair job for a damaged fender on one of their truck bodies that took only 2 hr. to complete. In repairing the fender, the damaged area was first sanded and the edges of the cracks were scarfed down with a sanding disk. Sections of fibrous glass cloth, tailored to fit the prepared areas, were then impregnated with polyester resin, covered with cellophane, rolled down, and pressed into the depressions. Excess resin was next

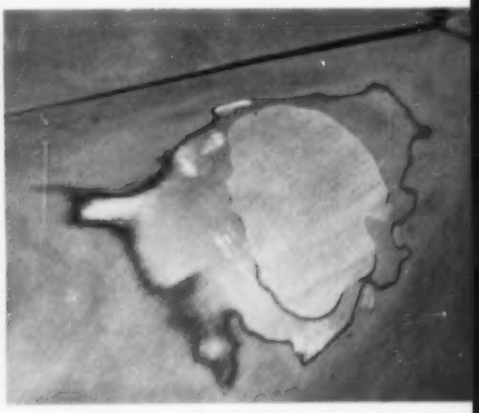
METAL PARTICLES "COLD SOLDER" KIT



2 "Cold solder" compound is applied to area to be patched



3 Cure of the epoxy-metal "cold solder" material is accelerated by heat from infra-red lamp



4 Repaired area, ready for sanding and priming. Elapsed time—45 minutes

removed and the entire surface smoothed down. The same process was used on the inside of the fender.

"Cold Solder"

Repair kits based on the use of finely divided metallic particles combined with selected resins have had rather limited use in the automotive repair field—although in recent months this application appears to be increasing in importance. The kits are more widely used, however, in sealing porous castings or seams in metal duct work, as a sealing or filling compound for welded or riveted seams in aircraft, truck bodies, and other metallic structures requiring use of a fairing compound, in rebuilding broken machinery, and in building up the inside worn sections of pumps, valves, and similar parts. Cracked motor blocks on cars and marine engines, as well as exhaust pipes, gas tanks, and water tanks are other types of units which may be effectively repaired with these materials.

It has been suggested that these "plastic solders," sold under various tradenames, could some day revolutionize automobile manufacturing, aircraft production, and numerous other metal product operations. Used in conjunction with a thinner and solvent which is added prior to application, the plastic solders can be applied without heat to various metals, fibrous glass, plaster, and other materials. Some of them may be used either in the form of a putty or, when sufficiently thinned with solvent, as a spray or coating that renders equipment impervious to rust, corrosion, or other elements. If faster curing and hardening of the materials is required, heat may be applied by means of infra-red lamps or other means.

In the majority of these so-called "plastic solders," the resin used is an epoxy, chosen for its excellent hardness, machinability, temperature and chemical resistance.

Another compound which has been used with considerable success in experimental auto body repair work consists of atomized aluminum powder in polyamide and epoxy resins. This solder adheres tightly to the metal body section and feathers smoothly, resulting in a finished repair job very difficult to distinguish from the original surface. The nonfuming, non-volatile solder is considerably lower in cost than all-metal fillers, has a lower melting point for easier working, and withstands high stress and impact without damage. Since it also eliminates corrosive fluxes, it is ideally suited for use on inverse metal curves, spot-weld dimples, and other fill spots. According to the manufacturer, the company's polyamide-fluid epoxy combinations can be successfully blended with a wide selection of fillers other than atomized aluminum powder.

Ease of application (see bottom photos, pp. 98-99), plus the excellent properties of these solders after hardening and their good machinability account for their growing use.

Suppliers

Among the many suppliers of fibrous glass cloth-polyester or epoxy resin repair kits are Bonded

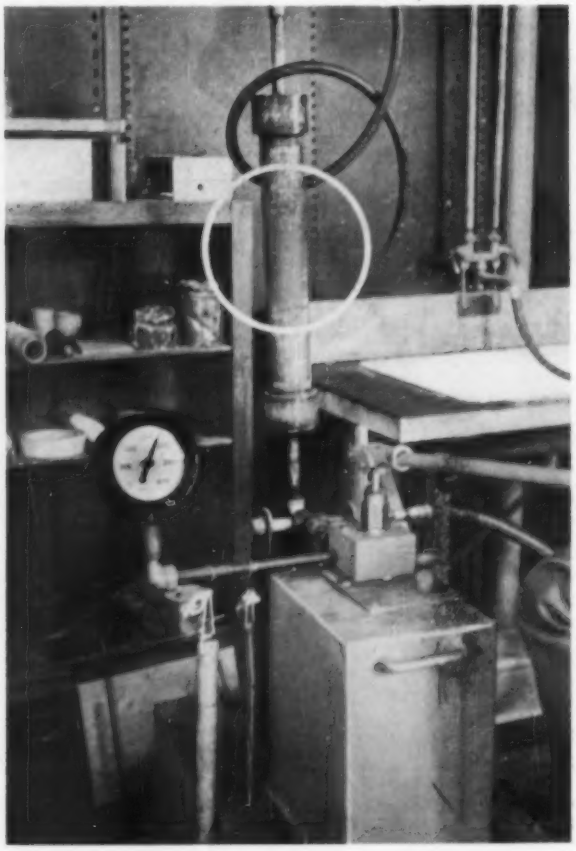
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Courtesy Fibreglass-Evercoat Co.



Cracked concrete foundations that allow water to leak through can be effectively sealed off with epoxy-glass cloth patch

Courtesy Bonded Products, Inc.



Pipe that has been repaired with plastic patch (circled area) successfully withstands applied pressure of 1700 p.s.i.

NEWS AND VIEWS OF PLASTICS PROGRESS

STOKES *plastics review*

VOL. 4
NO. 4
1955

PUBLISHED BY F. J. STOKES MACHINE COMPANY, PHILADELPHIA 20, PA.

Versatile Stokes Injection Molding Machine Produces Toy Parts for Winston Products, Inc....and "Doubles" in Profitable Contract Work



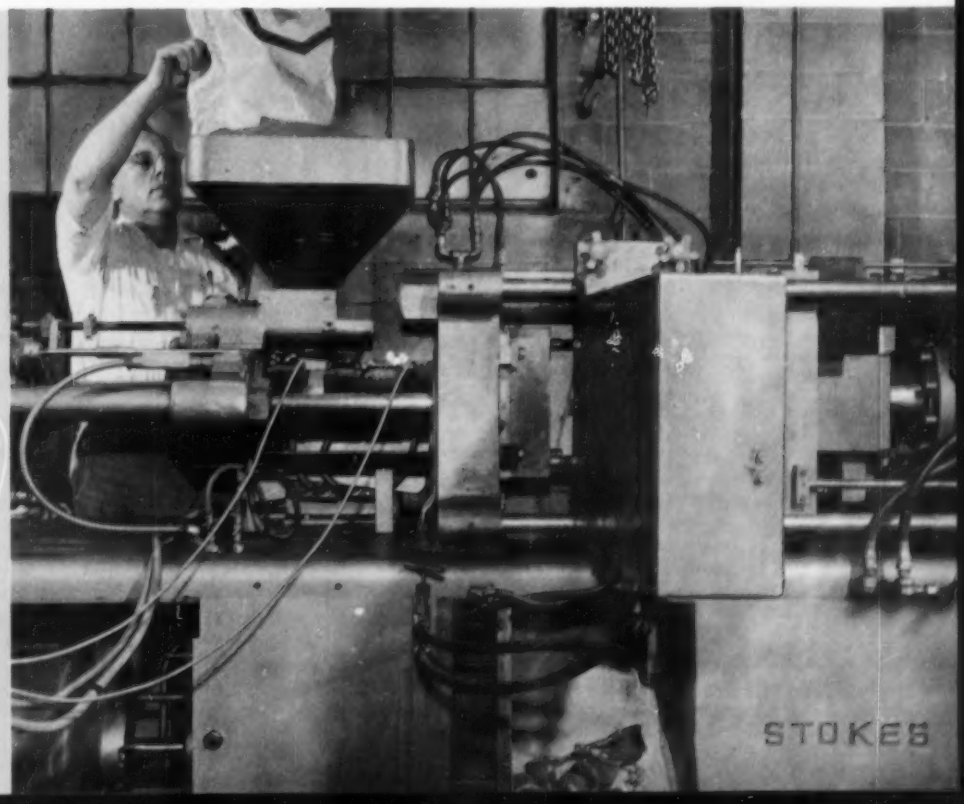
Caps for toy periscopes are the principal output of the Stokes Model 700 truly automatic injection molding machine at Winston Products. Between production runs of these parts, the versatile machine is used on contract work.

Truly automatic machine molds polystyrene end caps for periscopes

Winston Products, Inc. of Peoria Heights, Illinois purchased their Stokes 4-ounce truly automatic injection molding machine to mold the brightly colored end caps for the firm's inexpensive toy periscopes. These parts, molded of polystyrene, hold the periscope's mirrors. Two sets of caps are molded to a shot, then positively degated and automatically ejected, ready to be fitted with mirrors and assembled with the lithographed cardboard bodies used in the toy.

Between runs of periscope caps, Winston Products uses the versatile Stokes injection molding machine for profitable contract work. The fast set-up time, low mold cost and dependable, automatic operation of the Model 700 provide substantial economies in the important custom molding phase of the firm's business. According to Winston's president, Chester Wadley, "The Model 700 press has operated with excellent efficiency and we have encountered no difficulties in using it . . . We would purchase the same press today for any injection molding jobs!"

The truly automatic operation of the Stokes Model 700 is described in Bulletin No. 560. Ask also for the Stokes brochure, "Fully Automatic Injection and Compression Molding."



Only 120 arc hood covers are needed daily by Allen-Bradley, yet this small quantity is produced economically on Stokes Model 800 presses at Allen-Bradley's Milwaukee plant.

Stokes Automatics Economical on Short Runs

Model 800 Presses at Allen-Bradley mold small number of parts yearly at low cost



There are some cases in which increased production rate is not the sole criterion for using automatic molding equipment. For example, some molded parts made by Allen-Bradley Co. of Milwaukee, Wis. are not needed in great quantity; a few thousand suffice for a year. Yet to keep costs low, Stokes 15-ton Model 800 automatic compression molding presses are used in the production of these parts. Since smaller molds can be used, tooling costs are kept low. For certain parts, single-cavity dies are used because of the low production rate required. Since only 1/10 of an operator's time is needed to attend a press, labor ceases to be a significant factor in manufacturing costs. The molder is no longer confronted with a compromise between mold cost and labor cost per unit of production.

Stokes automatics and semi-automatic presses produce all the plastic parts used in the well-known Allen-Bradley line of starters, switches and controls. Many of these parts requiring high production are produced by the thousands daily on batteries of Stokes automatics. Other parts are molded semi-automatically on Stokes straight ram and transfer presses.

If you are interested in low cost production of short or long runs, automatic molding may be the answer to your problem. Ask for Bulletin No. 513, the informative Stokes literature describing the Model 800 press.

Quality and Style Build Sales for Presto Pressure Cookers

Handles for modern kitchen aids molded on two Stokes presses



Handles for Presto products are made on two Stokes semi-automatic presses at Century Manufacturing Company, Jackson, Miss. Versatile Bar Controller is shown at right.

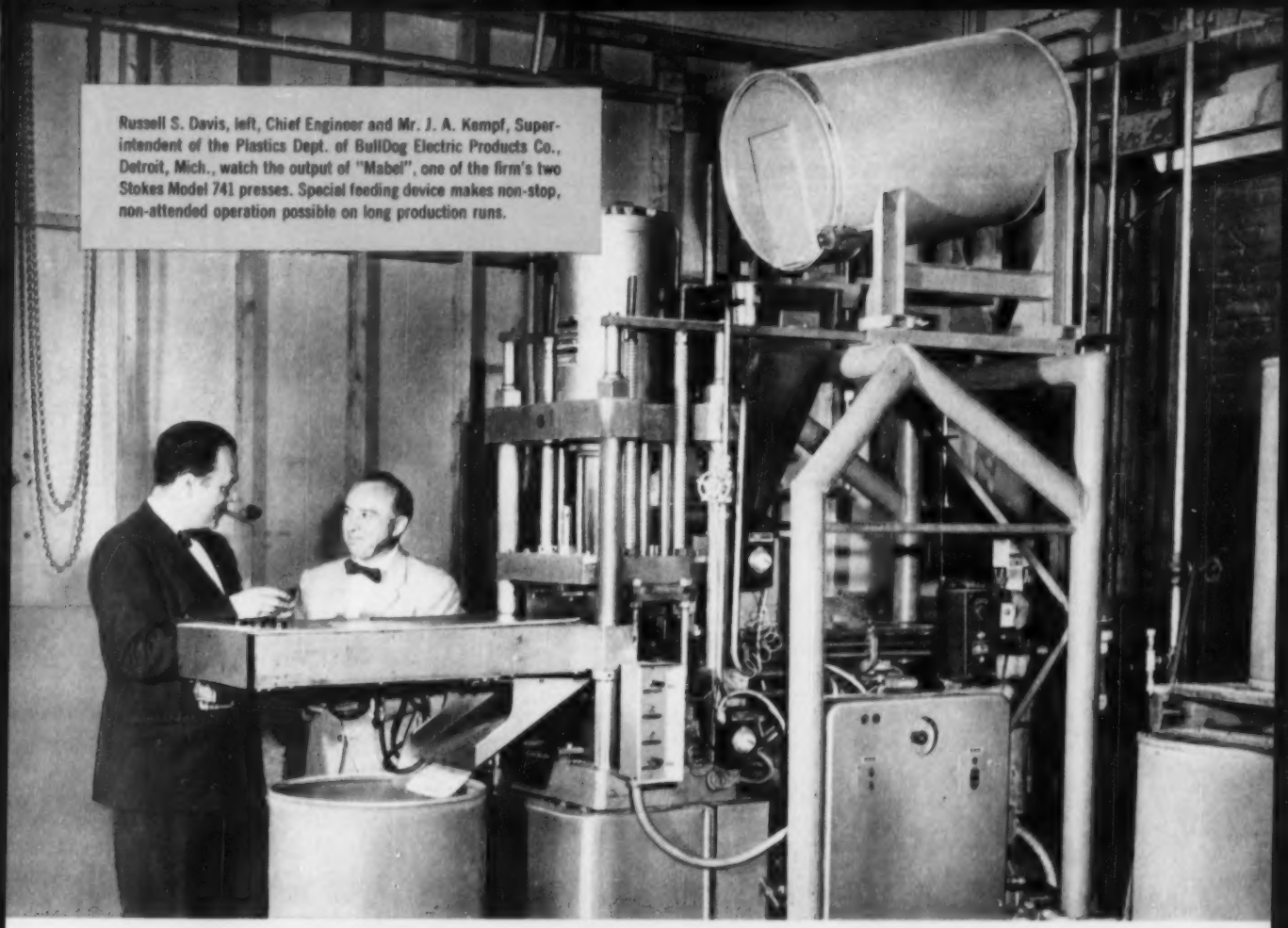
The way modern house-queens turn out dinners fit for their kings would probably startle their grandmothers, accustomed to spending hours over a hot stove. The pressure cooker has brought science to the kitchen, cooking—in minutes—roasts, stews and other "vittles" that formerly required hours.

One of the foremost names in pressure cooking is Presto, registered trademark of the National Presto Industries of Eau Claire, Wisconsin. In the field since the inception of modern cooking, Presto's newest pressure cooker is a gleaming beauty with streamlined plastic handles for cover and bottom.

Plastic handles for Presto's complete line of heavy-gauge aluminum cookers and steam irons are made on two Stokes semi-automatic presses at Century Manufacturing Company, a subsidiary of National Presto Industries, located in Jackson, Miss. Made of general-purpose phenolic, the handles lend elegance to Presto products through their modern styling . . . are functional by virtue of their heat-insulating properties.

Stokes Model 727 straight ram transfer presses are equipped with the patented Bar Controller for fast, reliable cycle control. Settings for each part may be quickly duplicated at any time through this feature, exclusive with Stokes straight ram presses. Other features of the Stokes line of straight ram presses are covered in Bulletin 520, available on request.





Russell S. Davis, left, Chief Engineer and Mr. J. A. Kempf, Superintendent of the Plastics Dept. of BullDog Electric Products Co., Detroit, Mich., watch the output of "Mabel", one of the firm's two Stokes Model 741 presses. Special feeding device makes non-stop, non-attended operation possible on long production runs.

BullDog Electric Products "Goes Automatic" with Stokes Compression Molding Presses

Chief Engineer tells how Stokes presses were selected for new Molding Department

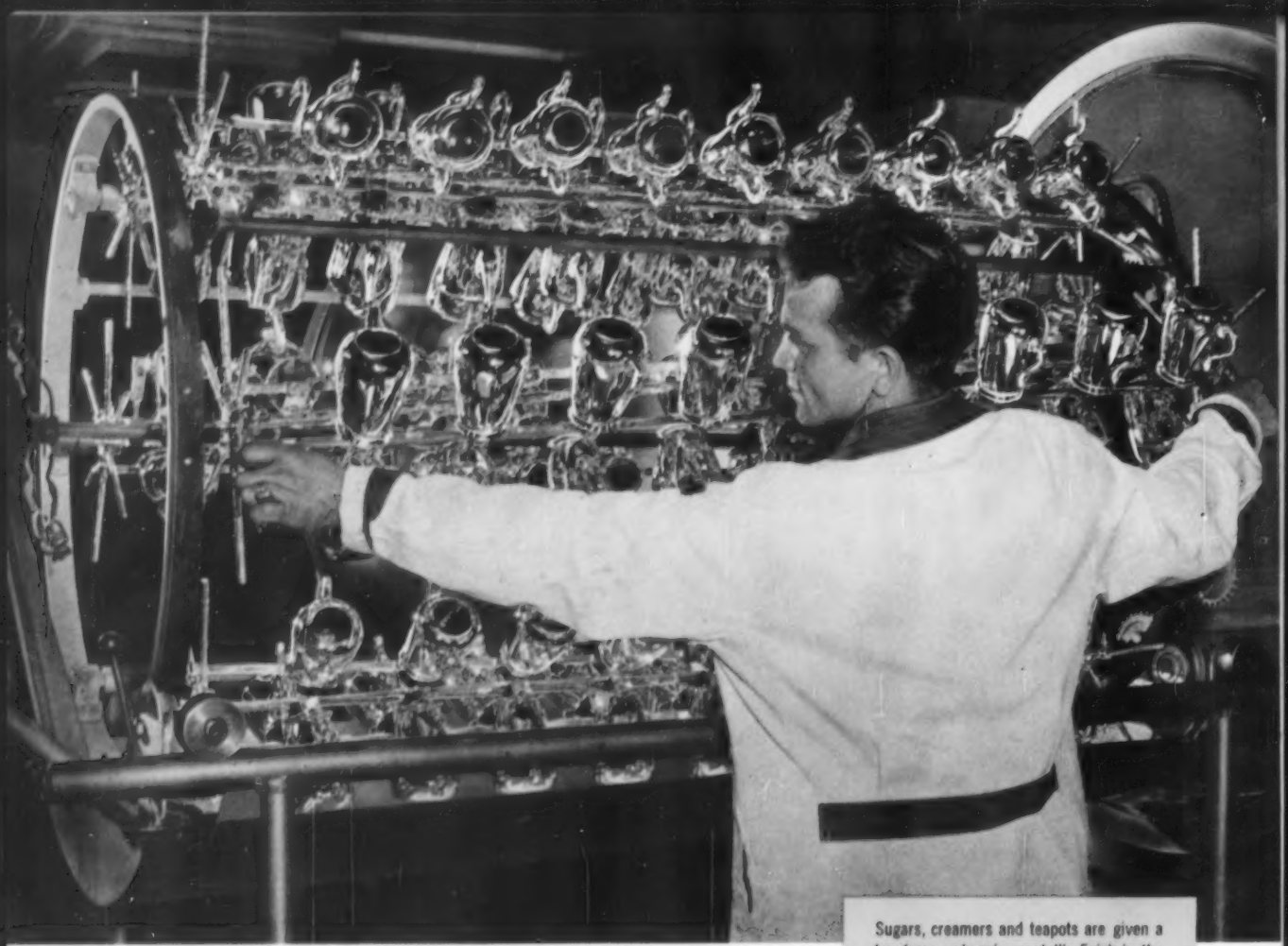
In keeping with constant advances of plastic materials and their ever-increasing use in electrical devices, BullDog Electric Products of Detroit, Mich., recently expanded its manufacturing facilities to include automatic molding of plastic parts. This was quite an undertaking for a company which has worked mainly in the metalworking field and required considerable planning, both from a tooling and equipment standpoint.

As Russell S. Davis, Chief Engineer at BullDog points out, "The economic feasibility of such a manufacturing activity is, of course, a paramount consideration, but inventory requirements, operating staff and engineering know-how are all important factors. And the proof of the soundness of this kind of study lies in the performance of the molding equipment selected."

Two Stokes Model 741 50-ton automatic compression molding presses were purchased to equip the new Molding Department. According to Mr. Davis, "Stokes Model 741 presses offered versatility, flexibility and simplicity in interchanging dies. Speed of closing, accuracy of curing time and easy ejection of complex, close-dimensional parts were also very important factors. This type of equipment," says Mr. Davis, "allows for maximum production quality and efficiency, and elimination of the human element in production cycle-time, minimizing scrap through controlled accuracy of material handling."

An interesting BullDog product being produced by the Molding Department is "Electrostrip", a sturdy molding—with wires imbedded in a strip of extruded plastic—that provides electrical outlets wherever they are desired by means of movable receptacles that lock into the strip. The plastic feed-in, T-fittings and 90° angles for "Electrostrip" are produced on the Stokes automatic presses.

If your operations include the use of a considerable number of plastic parts, it may be that automatic molding can lend economy to your operations. Two valuable aids in such considerations are the Stokes brochure, "Fully Automatic Injection and Compression Molding" and Bulletin 506, describing the Model 741 Fully Automatic Compression Molding Press.



Sugars, creamers and teapots are given a handsome, gleaming metallic finish in the Stokes 48-inch unit at Vacuum Metallizing, Ltd., Toronto, Canada.

Vacuum Metallizing, Ltd. Puts Sparkle Into Christmas Toys for Children

Canadian finishing firm uses Stokes unit to give eye-appeal to variety of parts

This is the time of year when the small fry come into their own. The Christmas season reserves its biggest thrills for the children, rightfully enough. And in this modern age, toys have kept pace to appeal to the more sophisticated tastes of today's youngsters.

For example, the brilliantly vacuum-plated plastic six-shooters produced by Vacuum Metallizing, Ltd. of Toronto, Ontario, will bring a gleam to the eyes of boys who find them under the tree. On the distaff side, tea sets and cutlery, vacuum-metallized to resemble the family's silver service, are gifts that give the "little ladies" hours of play-time pleasure.

Vacuum Metallizing, Ltd. has a healthy year-round business in the coating of plastics other than toys; trophies and other decorative plastic articles are given a brilliant, durable finish in the Stokes 48-inch vacuum metallizing unit. In addition, the versatile Stokes unit is used to apply molecular aluminum coatings to metal parts, adding a valuable side-line to the plastics which comprise the bulk of this Canadian firm's business.

The economy, versatility and ease of the vacuum metallizing process are discussed in Stokes Bulletin 780, which also describes the complete range of metallizing equipment available from Stokes. Ask for your free copy of this informative literature.

STOKES

F. J. STOKES MACHINE COMPANY
5534 TABOR ROAD, PHILADELPHIA 20, PA.

STOKES MAKES: High Vacuum Equipment, Vacuum Pumps and Gages/Industrial Tabletting, Powder Metal and Plastics Molding Presses/Pharmaceutical Equipment

PRINTED IN U.S.A.

PHOTO-SENSITIVE Vinyl

Organosol paste, especially compounded for the purpose, forms films which are exposed through negatives to ultra-violet light and developed by heat



Photo-sensitive vinyl film, ready for exposure

UNTIL very recently, photo-sensitivity in plastics materials has been obtainable only indirectly by the use of the plastics as bases for silver halides which, when exposed to light and subsequently "developed," undergo chemical change to form an image.

Now, however, a polyvinyl chloride composition has been developed which, because it is directly photo-sensitive, opens new fields to plastics in photographic reproduction. In this new material, produced by Ferro Chemical Corp., Bedford, Ohio, the reaction which produces a photographic image is thermal rather than chemical. Instead of reducing silver halides chemically, hydrogen chloride is removed from the plastic compound by heat and the image is formed by a resulting catalysis.

Composition of Compound

The base material, tradenamed Calimar, is an organosol paste produced by dispersing vinyl resins, such as Bakelite's, in plasticizer, diluent, and filler with a metal oxide catalyst, a suitable intermediate which will form dyes or pigments at development temperatures, and a reaction "fixer" to stabilize the picture against subsequent change in color.

Research on the photo-sensitive vinyl is sponsored by the U. S. Army Signal Corps with a view to obtaining a material for quick photo-print reproduction and map duplication in the field. Since film made from this organosol paste does not require wet developers for photographic reproduction, the advantages to the military are obvious.

For convenience in use, the fluid organosol may be cast on a metal plate to produce a film 0.005 in. thick. While the photo-sensitive vinyl

Organosol formulation is compounded . . .



and cast on metal backing plate . . .



where it is spread into even film





After organosol emulsion is air-dried . . .



it is baked to evaporate solvents

Photos with this article courtesy Ferro Chemical Corp.

film may be produced by knife-coating, spraying, or brushing, it has been found advisable in the laboratory to cast the film on metal and, after the photo-processing is finished, to strip the finished photograph from the metal backing. Since the emulsion is appreciably sensitive only to ultra-violet light, a dark room is not required.

After casting and spreading the emulsion evenly, the film is air-dried for 10 min. and then baked for 5 min. at 140° F. to evaporate the volatile solvents. At this point the film is in a soft, tacky condition and must be fused by heating to 320° F. for 2 minutes.

In making the exposure, the negative or stencil is placed on the film and is covered with a thin sheet of Corex glass or a ⅛-in. sheet of acrylic to hold the negative flat. The whole unit is then exposed to uniform ultra-violet light for from 1 to 5 min., depending upon the intensity of the source. Bright sunlight exposure is possible but takes up to an hour.

After exposure, the film is heated to bring out the picture. Heating must be uniform over the entire film area in order to prevent local over-development. Normal development time for a correctly exposed film is 4 min. at 320° F. For under-exposed film, development time may be as long as 10 to 15 minutes.

After cooling, the film is stripped away from the metal backing and the image may be observed by illuminating the film obliquely from the rear or by placing it on white paper.

Image Extends Through Film

The resulting photograph bears a continuous tone image which extends through the vinyl film. This depth of image combined with the resistance of the film to air, moisture, and chemicals assures exceptional durability of the photographic reproduction. Therefore a logical market would be in the field of blueprints, maps, and line drawings. But major markets are in the offing in the decorated vinyl field for such items as upholstery, coated fabrics, packaging, floor and wall coverings, and window shades. Portraiture is considered to be of secondary interest but identification cards are well suited to the product.

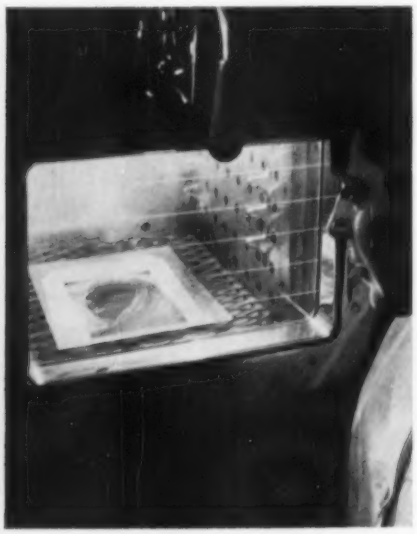
To date, Calimar images are in sepia tones but research is progressing on methods of obtaining true blue-black and even colored images. When this research is resultful, since the designs are *in* rather than *on* the film, the possibility of adapting the material to standard commercial equipment in casting and coating of vinyl organosols and plastisols are good and all that may be needed will be the addition of an ultra-violet light exposing section. As a matter of fact, in the case of laminated products, development of the exposed film might be carried out as part of the lamination cycle.



Negative and vinyl film are framed . . .



exposed to ultra-violet light . . .



and picture is developed by heat



Tradename medallion formed of gold-metallized butyrate sheet sets off rich black finish of the cover



Contoured recesses formed into base of the box provide snug fit for the various knives in the set



Courtesy B. F. Goodrich Chemical Co.

In some boxes, contoured recesses are formed into lid as well as base

Cutlery gift boxes, based on "sandwich" construction involving cardboard sheet inserted between formed rigid vinyl sheets, are

Styled for STRENGTH

PACKAGES formed from sheet plastics, already well on their way to revolutionizing the entire packaging industry, make still another significant advance with the introduction of a new line of high-style display and gift boxes pressure formed of rigid vinyl sheet.

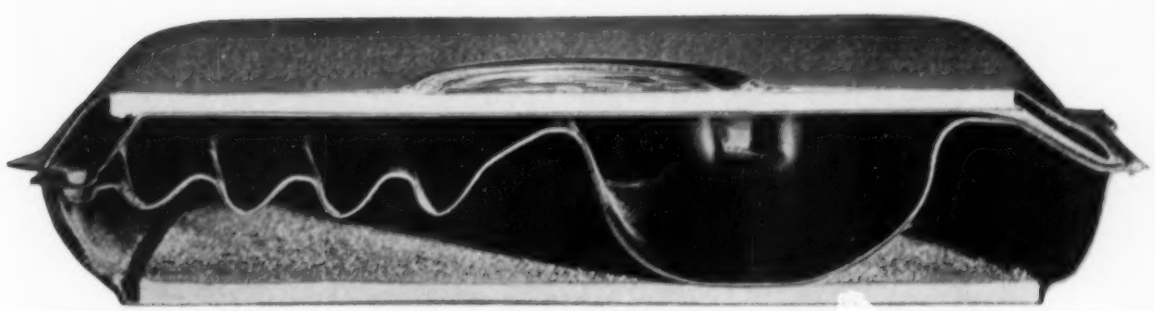
Used for packaging "Carvel Hall" stainless steel cutlery and tableware, the cases are designed around a "sandwich" contruction involving a sheet of medium-weight cardboard inserted between layers of relatively thin high-impact vinyl sheet. According to Plaxall, Inc., manufacturer of the unit, the sandwich construction gives sufficient rigidity to the formed contour package to permit it to take normal abuse without bending, denting, or twisting out of shape. It has even been demonstrated that the case is strong enough to support the weight of an adult standing on it.

Such sandwich construction thus makes it possible for the first time in this type of packaging to combine the many advantages of high-impact vinyl sheet with the functional concept of contour packaging.

Luxury Appearance

The packages, which were only recently introduced by Chas. D. Briddell, Inc., Crisfield, Md., are formed from an attractive, rich black vinyl sheet. A leather-grain texture added to the top surface of the case during the forming process and a three-dimensional medallion formed

(*To page* 215)



Courtesy Plaxall, Inc.

Cross-section of new cutlery display box illustrates sandwich construction which makes for greater rigidity. Both lid and base of box consist of cardboard sandwiched between two formed vinyl sheets electronically sealed together

Formed Sheet Styrene Copolymers

Lower tooling costs, flexibility of length of run, and light weight with great strength are among advantages of these materials



Fig. 1—Rugged pirn magazine for use on bobbin winding machine consists of formed styrene copolymer tray (top part) to which metal fins are riveted

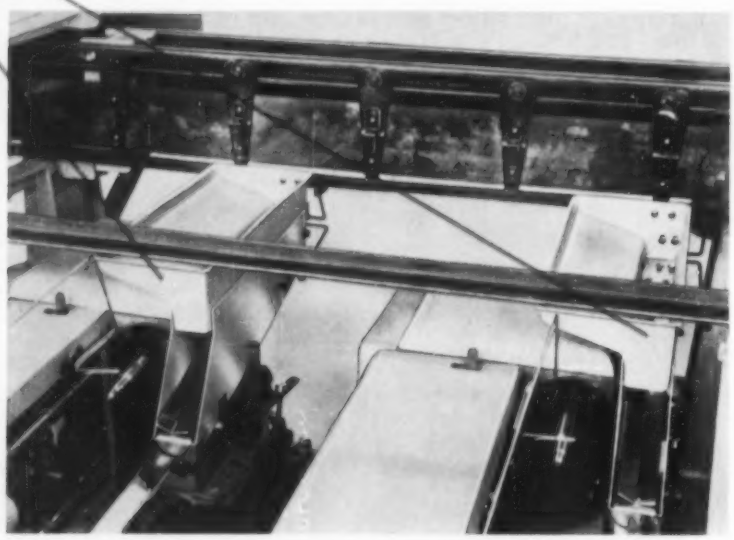


Fig. 2—Close-up of two pirn magazines installed in winding equipment. These magazines receive empty bobbins fed along the top of the machine and dropped off a conveyor belt into them

Photos this page courtesy U. S. Rubber Co.

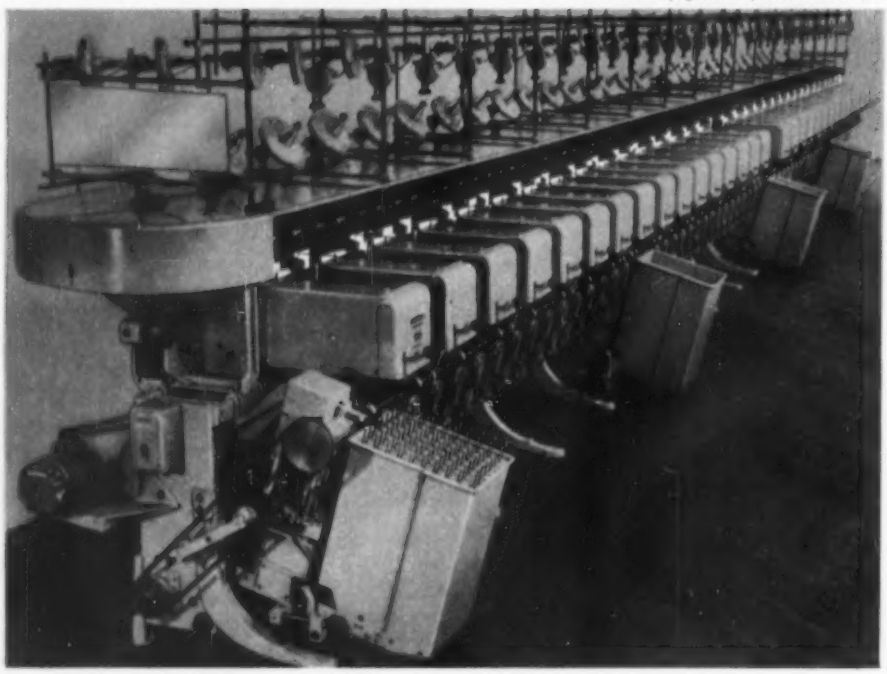


Fig. 3—Over-all view of bobbin-winding machine. Location of pirn magazines on equipment is indicated by the black-and-white portion of the photo

Invade Metal Stamping Field

WITH all the excitement surrounding vacuum and drape forming of styrene copolymer sheet materials, by far the greatest number of applications developed to date have been in consumer product components such as refrigerator doors, automobile trim, and furniture drawers, and in displays and packaging.

But a few fabricators of these materials have foreseen a market for them as industrial equipment components where they may replace or complement stamped and formed metal parts.

Styrene copolymer sheet stock shows every indication of not only replacing many industrial metal stampings, but also of reducing the number of assembled components for industrial end products previously made by this method.

In developing this industrial-component field, the two factors of engineering design and close tolerance accuracy in fabricating are of most significance.

A case in point is Duplicon Co. Inc., Westboro, Mass., primarily metal stampers specializing in short runs. About 2½ years ago the company started to feel its way in plastic sheet forming for the following reasons, as given by sales manager John J. Head:

1) With plastic sheet we could supply our industrial customers with short or long runs of drawn housings, caps, covers, guards, etc., made on relatively inexpensive tools.

2) Our customer would then get a better product with a tool charge even lower than with the most inexpensive tools required for metal stampings.

3) Intricate forms and compound curves, impossible to accomplish in metal, would be fairly simple to achieve with drawn sheet plastics.

4) By combining metal and plastic, advantages of both materials could be incorporated where required in a given part.

Principles of Forming

The exact steps in producing a formed part from styrene copolymer sheet may vary somewhat, but the general principles are fairly uniform:



Fig. 4—Operator has removed heated sheet in clamp frame from hot plate on which a second sheet is being heated



Fig. 5—After both sides of sheet have been dusted with zinc stearate parting agent, clamp frame is placed over cavity half of mold



Fig. 6—Mold is opened at end of cycle and formed part, with excess material still clamped in frame, is removed from it



Fig. 7—Excess material is removed from part by steel rule die (shown held by operator), using pressure provided by air cylinder above jig



Fig. 8—Opening is cut into bottom of part by sawing through formed section



Fig. 9—Necessary assembly holes are also punched after part is formed



Fig. 10—Two metal fins are assembled to the formed part by riveting

the sheet is first heated to forming temperature, after which it is quickly formed to the desired shape, generally with molds consisting of male and female parts. The sheet can, of course, be formed by blowing or suction, but the more intricate industrial parts are generally formed by matched molds. After forming, excess material is trimmed either by dinking or sawing, and any required holes are pierced or drilled.

Case History

Several industrial components formed by Duplicon are illustrated and described; of these, one has been selected for detailed attention. This is a combination of formed styrene copolymer sheet and metal in a pirn magazine (Figs. 1 and 2), a component of a bobbin winder (Fig. 3) manufactured by the Foster Machine Co., Westfield, Mass., for the textile industry. In the operation of this machine, the empty bobbins (or pirns) are fed along the top of the machine and dropped off a conveyor belt into the magazines. Because of the constant series of impacts as the bobbins hit the magazine the latter must be tough and durable. Additional advantages of the formed sheet magazines are that they are light in weight, noiseless during operation, will not rust, and do not require painting; they are neat in appearance and they require far less expensive tooling than if made of formed metal.

Specific steps in producing the pirn magazine shown in Fig. 1 are illustrated in a series of accompanying photos. In Fig. 4, the operator is holding in his hands a sheet which has just been heated on the hot plate shown at the left. A second sheet is being heated. Note that the sheet is clamped in a frame. This clamping feature generally permits the use of a somewhat smaller sheet than would be required otherwise, since the rigid clamp prevents the sheet from shrinking while it is being heated.

After a parting agent of zinc stearate powder is dusted on both sides of the sheet, the clamp frame and sheet are placed in position on top of the female half of the mold (Fig. 5). The mold is then closed (in this case by an air cylinder) and the male half of the mold forces the sheet to take the form of the female.

After cooling, the mold is opened and, as shown in Fig. 6, the formed part with the excess material still clamped in the frame is removed from the mold. A fixture comprising a cavity in which the formed part may be nested and a steel rule die is then used to trim the excess from the part. In Fig. 7, this step has been completed and the operator is holding the steel rule die; the trimmed part may be seen slightly raised in the holding fixture. Pressure for accomplishing this was applied by the air cylinder shown in upper center.

In forming operations of this nature, large area openings are not generally pierced during the forming operation. In the case of the pirn magazine, the opening in the bottom is made by sawing through the formed section as shown in Fig. 8. The necessary assembly holes are then punched as shown in Fig. 9, after which the metal fins or flanges are assembled by riveting. Figure 10 shows the plastic component as well as the two metal stampings and rivets. The operator is holding an assembled part.

Spring Shipper

Another interesting industrial application is a shipping container made for Metal and Controls Corp., Attleboro, Mass., large manufacturers of coil springs. After the springs are wound and cut they must be sent to another plant for heat-treating. Many methods of shipping have been attempted but the springs became entangled and the labor for separating them was excessive.

Figure 11 shows the result of ingenuity of design which took advantage of the accurate and uniform formability of styrene copolymer sheet. Each coil spring has its own receptacle; when loaded into the shipping container, as shown at the right in Fig. 11, there is no possibility of tangles. The cover shown at the top fits snugly against the tops of the springs, thus holding them in position. The unique feature of this development is that the heat treater's metal jig has the same number and location of receptacles as the shipping container so that the jig merely need be placed in position over the springs in the container and the two inverted together; each spring will drop to its proper location in the heat-treat jig. After heat-treating and cooling, the springs are transferred back to the shipping container in the same manner, the container is covered, and the unit shipped to the manufacturer.

Protective Covers

Pratt & Whitney Aircraft, East Hartford, Conn., uses several types of protective covers and plugs made

of styrene copolymer sheet to the aircraft company's specifications. These covers and plugs are used over critical openings in jet engine parts that are vulnerable to dust, chips, and small bolts and nuts. These devices are used during assembly and after sub-assembly of parts, and, of course, are re-usable. They have saved the company time and money by replacing masking tape which, as a company engineer states, "takes a long time to apply and remove."

One of the most recent products of this type is a protective cover for the vane and shroud air inlet case in the J-57 turbo-jet aircraft engine. Five months were spent on the project before a satisfactory cover was developed. It resembles an automobile tire and rim and fits into the center of the inlet case, protecting the part's tubes and hollow vanes from chips and dust during machining operations. This technique satisfactorily eliminated the need for masked tape which was used formerly to protect the tubes and hollow vanes.

Because the required circumference of this protective cover was slightly longer than the width of a standard sheet of material, it appeared at first glance that the sheet former would have to go to the next larger standard size sheet, and put up with a sizable amount of waste. Duplicon, however, came up with an ingenious but simple idea which made it possible to use a strip of material that was somewhat shorter than the over-all length of the finished part. This was accomplished by stretching the heated sheet to the length required as well as forming it to the desired shape.

Another protective device is formed in the shape of a plug and is used to protect the mount pad of the same jet during engine assembly. Its over-all diameter is 6½ in. and the plug diameter is slightly more

(*To page* 227)

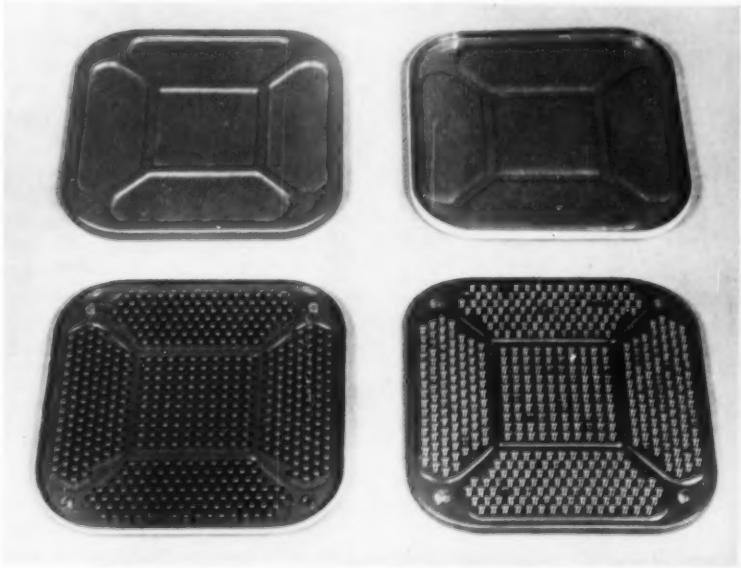


Fig. 11—Formed copolymer shipping container for small coil springs solves problem of tangles. Each spring has own receptacle (right), is held in place by snug-fitting cover

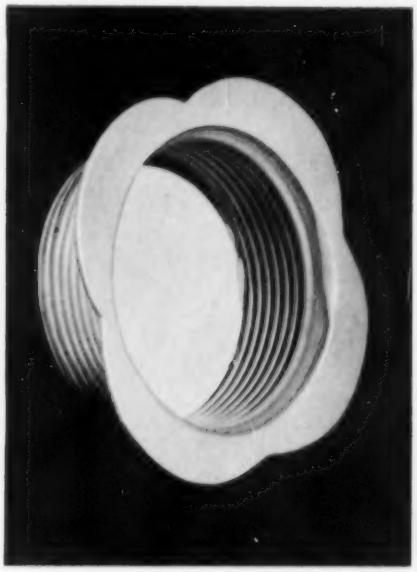


Fig. 12—Cap formed of styrene copolymer protects threads of lathe spindle during transport

Fig. 13—Dual conveyor device has formed copolymer trays riveted to metal framework

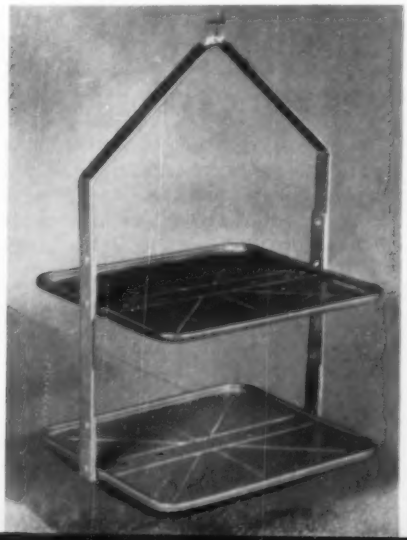
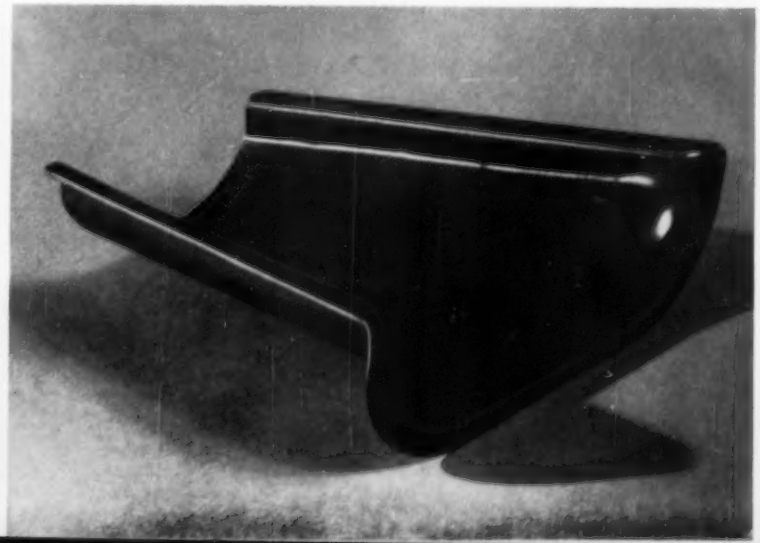


Fig. 14—Formerly made of chrome-plated metal casting, sliver pan used in textile industry is now formed of copolymer sheet. Reasons: it is longer wearing and less expensive



PLASTICS

Butyrate Device Measures Speed of Boats



Portable speedometer designed around a clear butyrate tube and various component parts also molded of clear butyrate can be used to tell how fast a boat is traveling. A graduated scale measuring speeds from 5 to 35 m.p.h. is marked on the outside of the tube.

To use the speedometer, the smaller end of the butyrate tube, which has an inlet opening, is simply submerged in the water alongside the boat with the opening pointed in the direction of travel. When the tube is lifted out vertically after a few seconds, the speed can be read directly from the point along the graduated scale which is reached by the top of the water column. A bronze check ball inside the tube closes the inlet during the reading; after use, the water in the tube can be drained out through a hole in the cap.

Because of the corrosion resistance of butyrate, the speedometer can be safely used in salt or fresh water. It can easily be wiped clean of mud or silt which might cover up the scale and it is tough enough to withstand normal abuse without shattering. The "Speed-Wand" speedometer is especially helpful in selecting the proper outboard motor angle for maximum boat speed.

CREDITS: Manufactured by Betzel Specialty Mfg. Co., P. O. Box 113, Arlington, Tex.; molded parts by Libbert Tool and Die Co., Ft. Worth, Tex.; extruded parts by Southwestern Plastic Pipe Co., Mineral Wells, Tex. Tenite butyrate supplied by Eastman Chemical Products, Inc.

Compass Housing in Plastic



Accurate information about directions while traveling in an automobile is provided by an attractive, functional compass housed in a case assembled from parts molded of butyrate. Although small and light in weight, the compact unit is highly resistant to breakage and is equipped with a versatile mounting bracket that can be adjusted to permit installation from a variety of angles. The injection molded butyrate parts include the tough, lustrous gray base of the housing and the crystal clear cover which is cemented into the base. Side core pins are used in molding the base to produce an opening for a lightbulb to illuminate the compass. Also molded of butyrate are a sealing disc, a compass card, sealing plugs, and a small ornamental top piece.

CREDITS: Using Tenite butyrate, housings are molded by Keolyn Plastics, Inc., 2731 N. Pulaski Rd., Chicago, Ill., for Blackstone Mfg. Co., Inc., 4630 W. Harrison St., Chicago.

PRODUCTS

All-Polyethylene Trash Can

In line with the growing trend towards the use of corrosion-resistant, flexible polyethylene for trash disposal units, a new type of 10-gal. trash can, molded in one piece of polyethylene, has now been introduced to the consumer market. The tight-fitting lid for the can, also molded in one piece of polyethylene, fits over a flange molded around the rim of the can.

By thus using an all-polyethylene design, the danger of marring floors, woodwork, or furniture with sharp hard edges is completely eliminated. In addition, corrosive materials that would eat holes through containers made of other materials do not affect polyethylene, which resists the action of water, soaps, grease, oils, and acids or alkalies. An added advantage that is inherent in the one-piece construction (including a convenient set of molded-in handles at the top of the can) is the absence of seams through which liquids might leak.

The large container, which stands about 20½ in. high and has a dia. of 13¾ in. at the top, can be used as a catch-all for emptying ordinary-sized wastebaskets—thus saving the housewife extra steps. The can is available in red, yellow, green, white, grey, or copper colors. A molded-in ribbed design adds to its visual appeal.

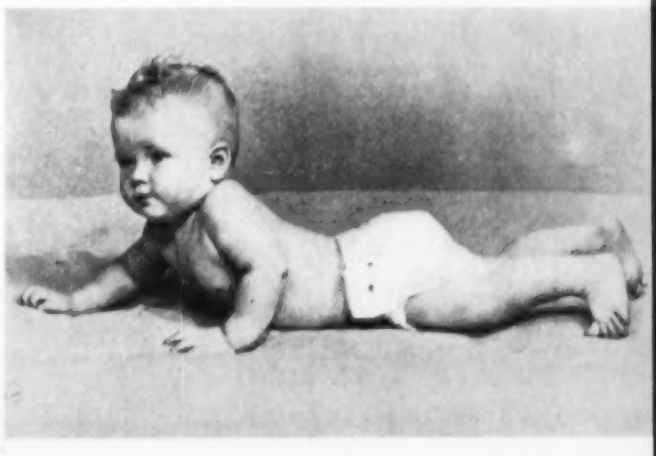
CREDITS: The trash can and cover are manufactured by Loma Plastics, Inc., 3000 W. Pafford St., P. O. Box 11277, Ft. Worth, Tex., using polyethylene supplied by Bakelite Co.



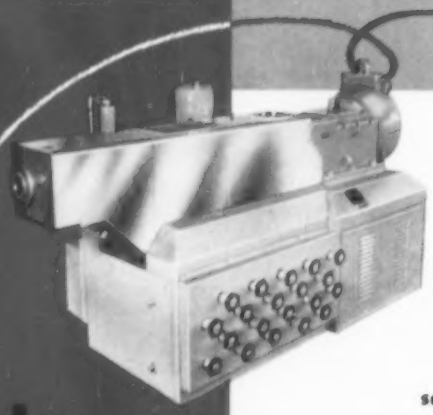
Plastic-Coated Disposable Diaper

Greater comfort for baby, more convenience and less work for mother, are the themes behind the introduction of a new type of pleasantly scented disposable diaper and baby pants combination made up of non-woven fabric and fluffed cellulose pulp coated with polyethylene. The soft fabric-and-pulp lining functions as a diaper that absorbs up to 15 times its own weight in water; the outer coating of polyethylene takes the place of the usual baby pants and provides hold-together strength, water and chemical resistance, and a pliant, soft surface texture. About one-tenth the weight of the lightest cloth diaper, the new combination folds up so compactly that a day's supply will fit in a handbag; after use, it can be simply disposed of in a trash can.

CREDITS: Coated with polyethylene supplied by Bakelite Co., the disposable Blessings diapers are produced by Blessings, Inc., 149 Madison Ave., New York, N. Y.



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Vinyl Plus Reinforced Plastics

—newest laminate for business machine housing components

by F. W. REYNOLDS† and L. N. CHELLIS†

EXTENSIVE research in recent months has focused on finding solutions to the problems inherent in combining vinyl sheeting and reinforced plastics in the form of a laminate for business machine housings.

Preliminary studies had made it evident that this type of construction is ideally suited for the business machine field—and the results of the current research program have gone one step further by clearly indicating that the laminate can be produced on a practical and economic basis. As a result, IBM is now turning out on a pilot plant scale vinyl-to-reinforced plastics laminate business machine covers for field evaluation. At the present time, the covers are intended for use on the IBM 086 High Speed Card Sorter, but other models based on the laminate construction are expected to be released for production in the near future.

From the standpoint of the manufacturer of business machines, there are many advantages which the vinyl-to-reinforced plastics laminate construction has over painted steel and/or vinyl-to-metal laminates, namely: lighter weight, high resistance to denting, improved sound reduction, greater flexibility in design, an appreciable reduction in tooling costs, lower unit cost, reduced maintenance problems, resistance to cigarette burns, greater bond strength (as compared to vinyl-to-metal laminates), and superior scratch and abrasion resistance.

Major disadvantages of the vinyl-to-reinforced plastics laminates are the low heat dissipation factor and the problem of providing a medium for radio-interference elimination—both of which are far outweighed by the many advantages.



All photos with this article courtesy International Business Machine Corp.

Lightweight, rugged, and attractive covers for high-speed card sorting machine are based on laminate construction involving vinyl sheet bonded to reinforced plastics

Table I, p. 122, shows the relative merits of vinyl-to-reinforced plastics laminates, vinyl-clad steel, and painted steel as cover materials. No attempt has been made to assign actual values to the properties listed. The table is intended to be used only as a comparative chart.

But while the advantages of the vinyl-to-plastic laminate made the material a natural for business machine housings, there were many problems in design, production, and finishing that had to be solved before the laminate would be commercially acceptable. The immediate problems that had to be taken under consideration were:

1) designing a part consistent with the process limitations imposed by the materials;

2) developing a supported or unsupported, embossed, and calendered vinyl as an overlay sheet that could be satisfactorily bonded to the polyester-fibrous glass during the molding operation;

3) formulating the resin for low-

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† Plastics Laboratory, International Business Machines Corp., Endicott, N. Y.



Fig. 1—Basic problem in forming laminate cover was wrinkling which occurred in vinyl sheet around inside corner construction (top, center)

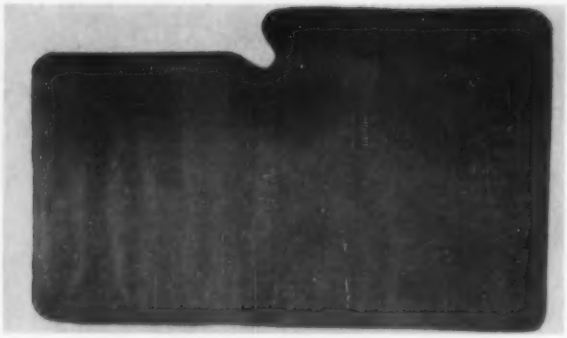


Fig. 2—By removing excess vinyl sheet in the inside corner prior to forming, wrinkles and fractures were completely eliminated



Fig. 3—Close-up of wrinkled edge which resulted from use of laminate in which excess vinyl was *not* properly removed from corner

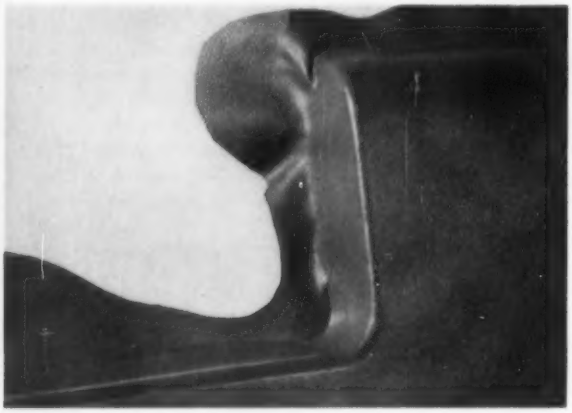


Fig. 4—Wrinkle-free forming illustrated in above close-up of inside corner is achieved by cutting vinyl sheet as shown in Fig. 2

temperature cure in economical cure time;

4) establishing proper molding techniques for producing parts that: a) are free from pattern distortion; b) are free of wrinkles in the vinyl sheeting; and c) meet rigid quality standards;

5) attaching stiffeners and metal fasteners to the vinyl-fibrous glass housings;

6) developing satisfactory and economical molding materials; and

7) devising methods for low-cost finishing and assembling of the laminate sections.

Part Design

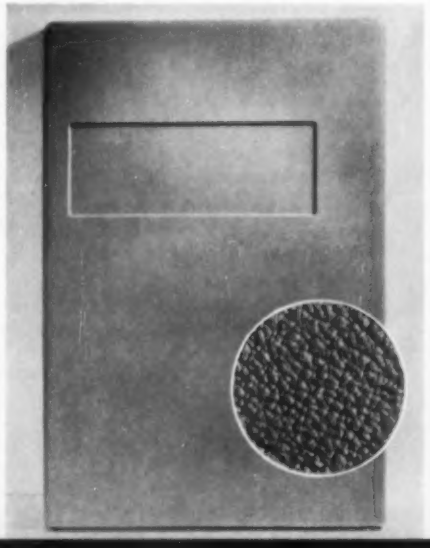
In tackling the first of these problems, that of part design, the major design limitations (imposed particularly by the use of vinyl sheeting) that had to be taken into account involved: 1) corner radii construction; 2) depth of molded part; and 3) application of metal brackets and stiffening members.

At the present time, limited experience in processing the laminate material has retarded the establishment of very firm design criteria. However, on the basis of research, a few considered recommendations are in order.

Best molding results can be obtained from a part that has been designed with a ¼-in. minimum outside corner radius. Where the part design requires inside corner construction (the intersection of two right-angle vertical surfaces), the radius should be a minimum of 1 inch. Where the depth of the part does not exceed 1 in., the radius increases proportionately to the increase in depth.

Figure 1 shows an untrimmed molded laminate cover with an inside corner construction. The wrinkling and fracturing of the vinyl sheeting around this corner was a major problem. After much experimentation, it was found necessary to remove the excess vinyl in the inside corner of the "blank," (see Fig. 2) preparatory to mounting the part on the draw ring. By using this technique, the wrinkles and fractures which appeared when the vinyl sheeting was *not* cut out at the corner (see Fig. 3) was completely

Fig. 5—Recess for opening is formed in cover. (Inset shows texture of vinyl)



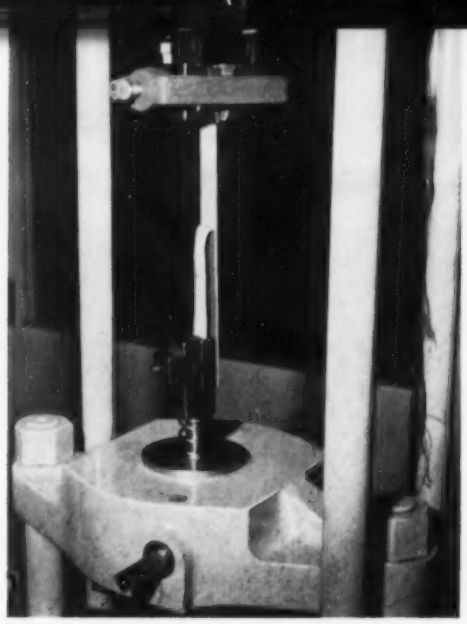


Fig. 7—Test machine used to determine degree of adhesion between vinyl sheet and reinforced plastics section

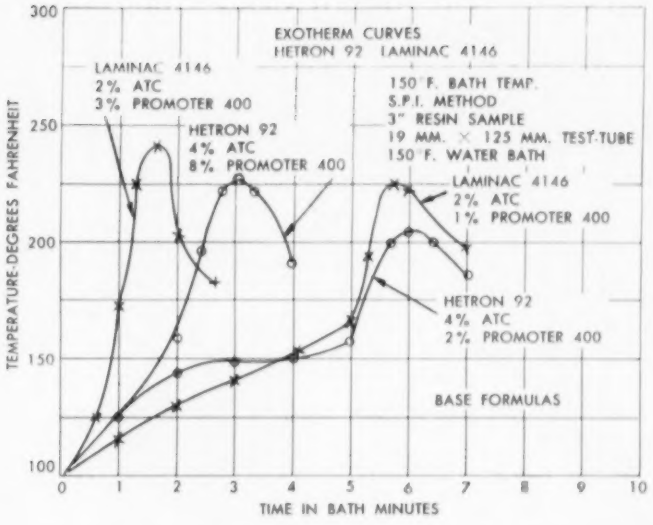


Fig. 8—Typical exotherm curves for two commercial resins are plotted from data derived from S.P.I. gel-time tests in a 150° F. water bath

eliminated (see Fig 4). It should be noted that there is no eradication of pattern on the vertical walls of the cover. The apparent smoothness shown in Fig. 4 is the result of lighting effects.

Where resistance to cigarette burns is required, the laminate part can be designed to incorporate a 2-mil sheet of aluminum foil, perforated with ⅛-in. holes on 7/32-in. staggered centers. The foil, located between the vinyl overlay sheet and the fibrous glass, provides instantaneous heat dissipation. The perforations allow for passage of the polyester resin to the fabric backing of the vinyl overlay sheet, so as not to interfere with bonding operations.

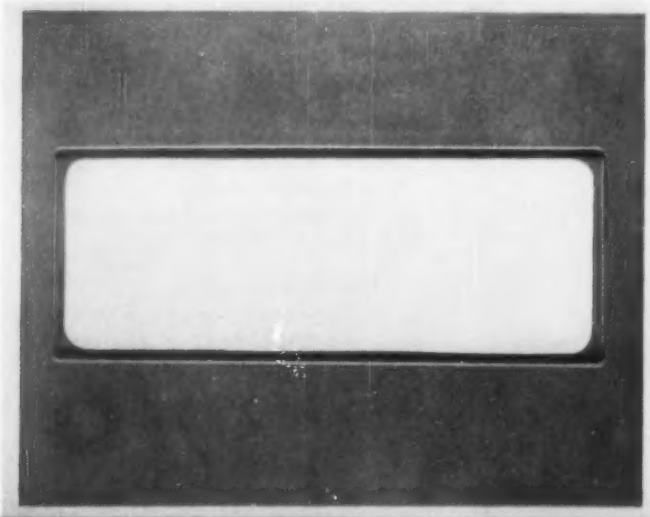
If the design recommendations are followed, it appears that the size of a molded part is limited only by the *maximum available width of the calendered vinyl sheets.*

A door or panel opening can be provided by molding a recessed area into the cover at the desired location (see Fig. 5). After molding, the recessed area is punched or routed out, leaving a narrow flange around the periphery for positioning the auxiliary panel or cover. (see Fig. 6)

It is recommended that large areas should be crowned to aid in maintaining flatness and to minimize warpage. Where this is not possible, metal stiffening members can be incorporated into the part during molding or can be assembled to it in subsequent operations.

Experience has shown that best results can be obtained by cementing the stiffening members onto the part after molding. On a cost-comparison basis this assembly technique is preferred to that of molding the members into place. When large metal inserts are used in the molding operation, the cycle time is increased appreciably. Tool cost is also increased, since provision must be made in the mold for locating the inserts. In addition, the difference in coefficient of thermal expansion between the metal inserts and the polyester contributes to warpage, resulting in a higher rejection rate. With properly designed cementing fixtures, the hardware can be assembled very economically.

Fig. 6—Recessed area is then punched or routed out of the cover (Fig. 5), leaving narrow flange around the periphery for positioning the auxiliary panel or cover



Vinyl-Fabric Overlay

Vinyl films do not have an affinity for polyester resins. Therefore, a major problem in developing the laminate was to find a material that would both bond to the underside of the embossed vinyl sheeting and adhere to the polyester-fibrous glass during molding.

Over a dozen commercially available adhesives and some new laboratory formulations were tried without success. While most of the adhesives bonded satisfactorily to the vinyl, there was not a single case where it adhered to the polyester. Consequently, there remained only two alternatives to the solution: either to develop a new adhesive that would be compatible with both the polyester or vinyl or to adhere a fabric material to the underside of

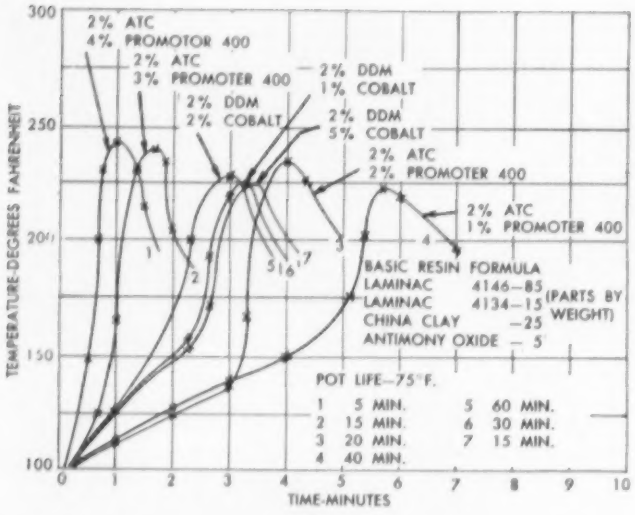


Fig. 9—Series of exotherm curves at 150° F. water bath temperature for the two catalyst systems in a Laminac 4146 formulation

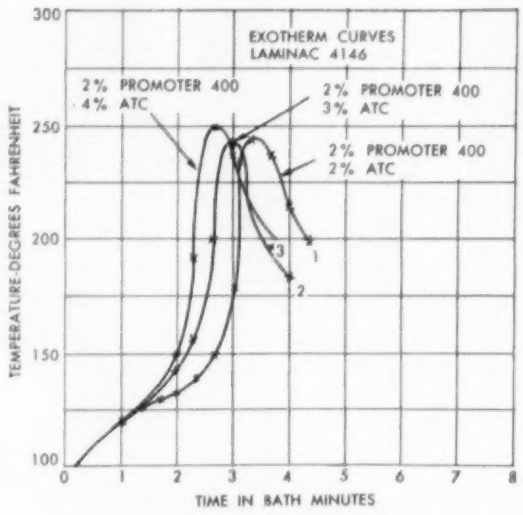


Fig. 10—Changes in promoter concentrations affect cure properties much more than do changes in peroxide concentrations



Fig. 11—Cavity half of mold for forming cover is clamped to upper platen

the vinyl sheeting in such a manner that the unbonded or exposed fibers would present a mechanical locking surface for the polyester resin.

The first alternative was dropped because of the time-consuming and costly basic research that would be required to develop an adhesive to meet all requirements.

Instead, the second approach was adopted. After experimenting with many different fabric materials and methods of application, a very satisfactory overlay sheet was developed in cooperation with O'Sullivan Rubber Corp. personnel. To produce the overlay, a 20-mil unembossed sheet of vinyl, in a minimum roll of 100 yd., is first knife-coated with either 5 or 8 mils of vinyl plastisol. A single ply of stretchable knitted-cotton fabric is then bonded to the plastisol by a fusion technique. After passing through a heating chamber, the vinyl-fabric laminate is roller-embossed with the desired pattern and subsequently rewound. The lamination and embossing is accomplished in a continuous operation. The laminate sheet is now ready to be securely bonded to the polyester-glass section.

When thus used as an overlay sheet, the vinyl-fabric laminate conforms perfectly to the shape of the mold cavity and provides bond strengths averaging 25 to 30 lb./in. of width.

The strength of the fabric-to-vinyl bond is dependent upon the proper fusion of the plastisol to the vinyl sheet as well as to the extent of penetration of the plastisol into the fabric.

Bond-strength tests on the molded covers are conducted on specimens cut to a width of 1 in. from the part. The test pieces are prepared by stripping back about 3 in. of the vinyl from the reinforced plastic. This end is clamped in one jaw and the opposite end in another jaw of a Tinius-Olsen testing machine (see Fig. 7). Bond strength is a measure of the force required to peel or strip the vinyl overlay from the polyester-glass laminate.

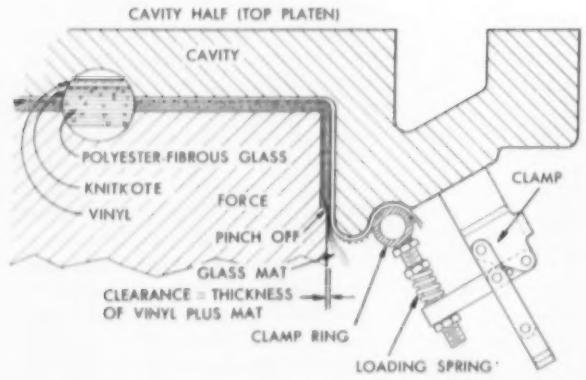


Fig. 12—Cross-section of typical cavity showing draw-ring, clamp groove, and the quick-acting clamps which hold the vinyl sheet securely in place during forming

Formulating the Resin

Distortion of the embossed vinyl is minimized if molding is carried out at temperatures lower than those

"Look... all the way from New York without a wrinkle!"



125 pounds of clothing hang inside this H&D wardrobe box—travel cross country without dust or wrinkles. Let us show you how H&D packaging can protect your product, too.



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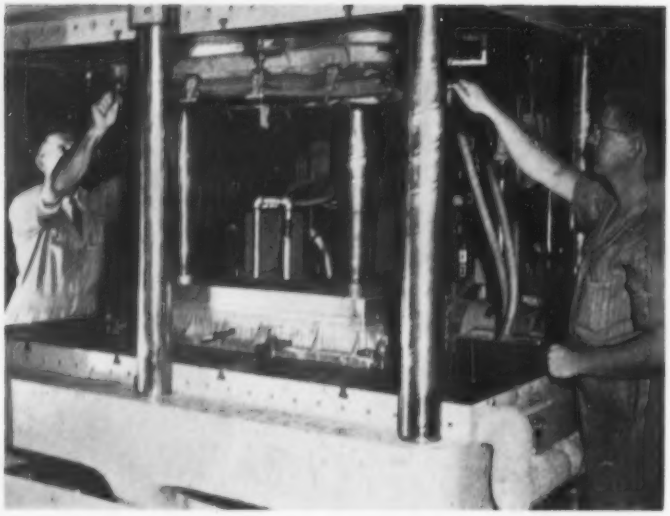


Fig. 13—When forming the cover, the vinyl overlay sheet is first locked into position under the cavity using the quick-acting clamps illustrated in Fig. 12

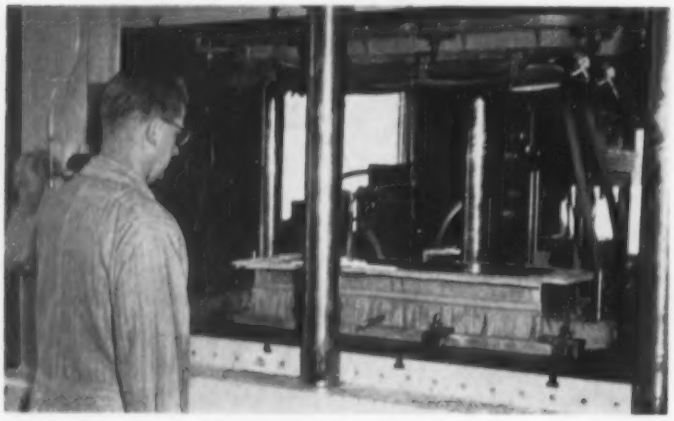


Fig. 14—Fibrous glass mat tailored to size is then laid up on the force of the press and impregnated with liquid polyester resins. The mold is now ready to be closed



Fig. 15—Before mold is opened, the quick-acting clamps are released and the clamp ring dropped from around the force. Air knockout facilitates removal of the piece

used in conventional matched metal molding. Through a series of time-temperature-pressure studies, it was determined that the molding can best be accomplished at 130 to 150° F. At this temperature the mold exerts a cooling effect on the vinyl and prevents damage due to the exotherm of the resin. Within this temperature range, pressures up to 1000 p.s.i. may be used without visible pattern distortion. Although it is generally desirable to operate at as low a pressure as possible, this latitude in operating pressure has helped considerably towards a solution of control problems in forming vinyl to various configurations.

Machine covers for electrical accounting machines must be fire resistant (self-extinguishing) if the machine is to be listed by Underwriters' Laboratories. For such cases, additives such as chlorinated waxes may be mixed with the standard polyesters. These additives are effective for extended periods at normal temperatures but tend to be fugitive when aged at elevated temperatures. In order to qualify for listing with Underwriters' Laboratories at 90° C., resins must remain self extinguishing after accelerated aging of 90 days at 238° F. At the present writing, two types of resins are preferred for the application: 1) HET acid resins (i.e., resins based on Hooker Electrochemical Co.'s HET acid—a chlorine containing dibasic acid) and 2) chlorinated Laminac polyester 4146 resin supplied by American Cyanamid Co. An addition of 5% antimony trioxide is used with either type of resin. Up to 15% of flexible resin may be added to combat warpage on relatively flat covers.

Selection of a catalyst-promoter system hinges on several factors.

1) Exotherm (should be as low as possible, yet consistent with full cures).

2) Required pot life.

3) Minimum cure cycles in the press.

4) Initial gel time as it influences flow properties and wetting properties of the resin.

Typical exotherm curves for two commercial resins are shown in Fig. 8. These curves were plotted from data derived from S.P.I. gel-time tests in a 150° F. water bath. The standard 19- by 125-mm. test tube was used with the sample oc-

cupying approximately 3 in. of the tube.

Figure 9 shows a series of exotherm curves at 150° F. bath temperature for the two catalyst systems in a Laminac 4146 formulation. Peak exotherms are not appreciably increased by higher accelerator concentrations at this operating temperature. Accelerator content does not appear to be a consideration in preventing damage to the vinyl pattern. In practice the diethylaniline-benzoyl-peroxide system is preferred over the DDM-cobalt system in spite of the longer pot life possible with the latter. The diethylaniline-benzoyl-peroxide combinations give tighter cures with higher Barcol readings on moldings direct from the press. This is evidenced by easier mold ejection and less tendency for warpage.

As evidenced by the curves in Fig. 10, changes in promoter concentrations affect cure properties much more than do changes in peroxide concentrations.

Excellent molding results have been obtained using 2 to 3% Luperco ATC and 0.2 to 0.3% diethylaniline. Pot life is adequate with any combination within this range.

In practice it is desirable to formulate the resins in two separate parts, with equal volumes of each part being mixed just prior to molding. This type of formulation lends itself well to automatic metering and dispensing of resins where high production conditions warrant it. A typical resin formulation follows:

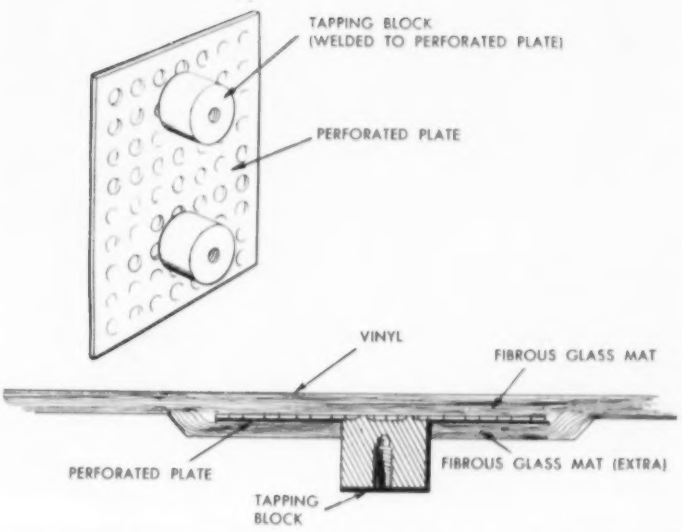


Fig. 16—Block to be molded into laminate is welded to sheet of perforated steel (top.) Prior to molding, extra resin-glass laminate is placed between metal and mold

Part A	
Laminac 4146	85
Laminac 4134	15
China clay	20
Antimony oxide	10
Luperco ATC	4
Part B	
Laminac 4146	85
Laminac 4134	15
China clay	30
Color paste	5
Promoter No. 400*	6

* 10% solution of diethylaniline in styrene by American Cyanamid Co.

It is to be noted that the above formulation is a typical resin formulation and does not, therefore, apply to all cases.

Under certain production conditions it has been necessary to make modifications: for deep covers, for example, the promoter must be reduced slightly to allow for longer flow time prior to gelling. The same is true for large flat areas, providing the resin is not fully distributed during lay-up. Adjustments in viscosity may be necessary to prevent

Fig. 17—To provide stiffness and a base for attaching fixtures, Unistrut members are cemented to cover on jig below

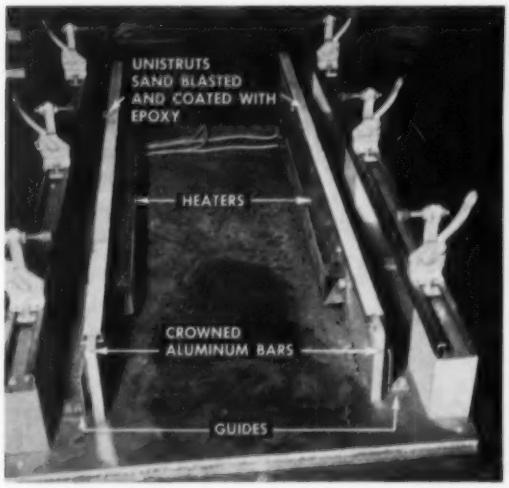
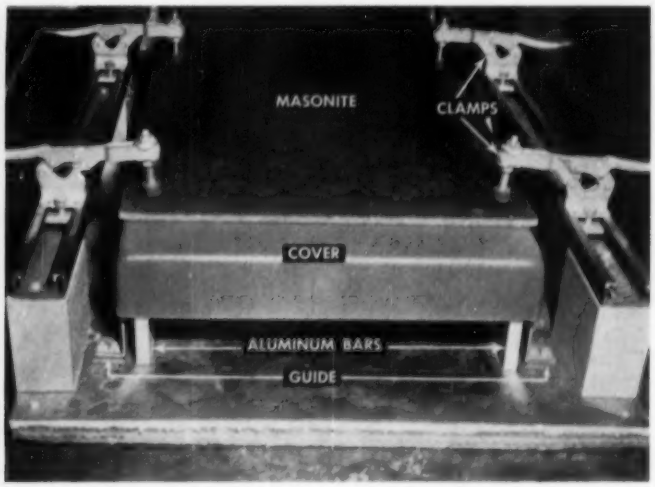


Fig. 18—In actual cementing operation, cover is placed over the adhesive-covered Unistrut members and light pressure is applied by means of clamps



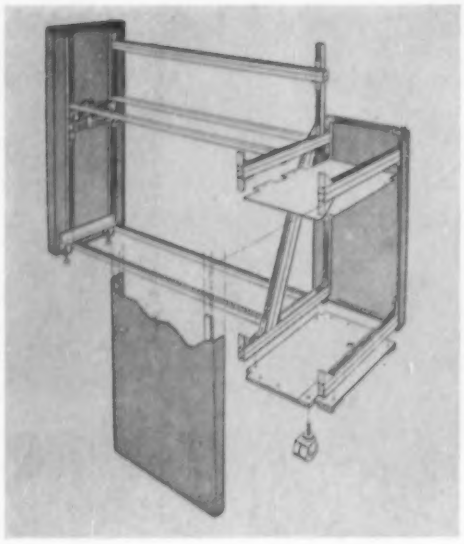


Fig. 19—Exploded view of frame of card sorting machine showing Unistrut members bonded to laminate

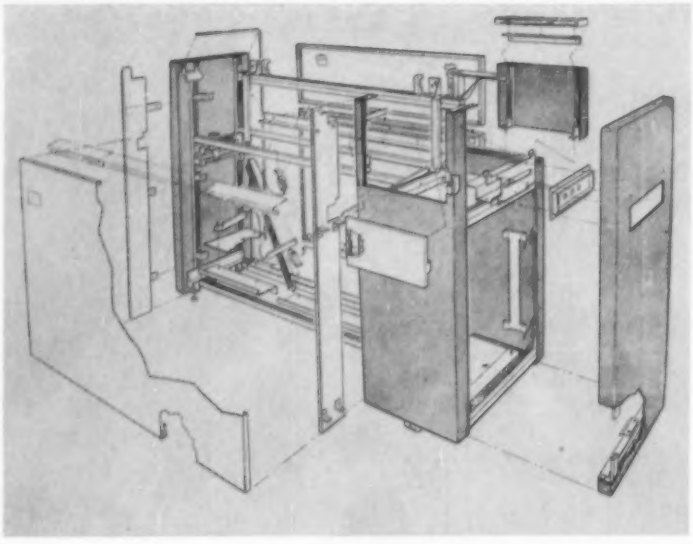


Fig. 20—Exploded view of entire machine shows framework tied to laminate covers through mounting brackets fastened to Unistrut members with standard fittings

washing or wrinkling. This may be accomplished by adding small amounts of styrene or by reducing filler content.

Molding Techniques

In molding the vinyl-to-reinforced plastics laminate, the basic established techniques for molding reinforced plastics in matched metal molds were followed, with slight refinements to accommodate the vinyl overlay sheets.

In almost all cases, the cavity portion of the mold is clamped to the upper platen of the press (Fig. 11). Figure 12 shows a cross-section of the typical cavity with draw-ring, clamp groove, and quick-acting clamps which hold the vinyl in place. Spring tension on the clamps must be determined by trial-and-error on each cover. Spring tension at various locations on the clamp ring can be varied by substituting lighter or heavier springs. With the clamping arrangement shown, it is possible to allow considerable slippage of the vinyl and at the same time to iron out wrinkles at the corners.

The vinyl overlay sheet is then clamped into position under the cavity (Fig. 13); the tailored fibrous glass mat, impregnated with polyester resin, is placed on the force (Fig. 14) and the mold is closed.

After curing, the mold is opened and the vinyl-to-reinforced plastics laminate cover is removed (Fig. 15).

It has been common practice in the reinforced plastics field to maintain very close clearances at the pinch-off areas of a mold for several reasons: 1) it greatly reduces edge finishing time, and 2) it prevents resin loss through excessive flashing. However, in the vinyl-to-reinforced plastics production process, it becomes necessary to increase these pinch-off clearances *to prevent shearing the vinyl* (see Fig. 12). If the vinyl is sheared during closing of the mold, the sheeting will creep back from the edge of the part since it is in a stretched condition, the resin has not begun to cure, and the bond to the vinyl backing has not yet been established. In practice it has been found that the clearance must be equal to the thicknesses of the vinyl plus its fabric backing.

The choice of fibrous glass mat instead of roving-preforms is dictated by economy and depth of draw. Where compound curvatures exist to which mat cannot be conveniently

Table I—Relative Merits of Business Machine Cover Materials

Property	Materials		
	Vinyl-Fiberglas	Vinyl-Clad Steel	Painted Steel
Weight	1[a]	3[a]	2[a]
Dent resistance	1	2	3
Sound deadening	1	2	3
Modulus-rigidity	2	1	1
Wear resistance	1	1	3
Electrical insulation	1	3	3
Heat dissipation	3	2	1
Cigarette burn resistance	1	1	3
Part design flexibility	1	3	2
Parts cost	2	3	1
Tool cost[b]	2	3	2
Radio interference elimination	3	1	1
Maintenance	1	2	3
Sources of fabric	1	3	1

[a] 1—Desirable; 2—Less Desirable; and 3—Poor.
[b] This comparison is with draw dies. Where steel covers are made by forming and welding, the tool cost would be less.

powerful plastic

Bright yellow HIGH VOLTAGE signs molded of Tenite Butyrate now provide a highly visible warning on crossarms carrying high-power lines. Extremely weather-resistant, these signs stand up indefinitely under outdoor exposure. They won't rust or corrode, and never need refinishing since the brilliant color is a permanent part of the Butyrate material.

Lettering and nail or screw holes are molded in the lightweight sign plates. The signs are easy to transport and install, and have good insulating properties as well as inherent toughness.

Weather-resistant Tenite Butyrate is also used today in many other outdoor products—such as illuminated display signs, oil-field pipe, sports equipment, tool and instrument housings. For more information about the properties, uses, and ease of fabrication of this versatile plastic, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

HIGH VOLTAGE signs produced from Tenite Butyrate by Revell, Inc., Venice, California, for Southern California Edison Company and the Los Angeles Department of Water and Power.



Information regarding Tenite also can be obtained from local representatives listed under "Plastics—Tenite" in the classified telephone directories of the following cities: Chicago, Cleveland, Dayton, Detroit, Houston, Leominster (Mass.), Los Angeles, New York City, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, Seattle, and Toronto—elsewhere throughout the world, from Eastman Kodak Company affiliates and distributors.

TENITE
BUTYRATE
an Eastman plastic

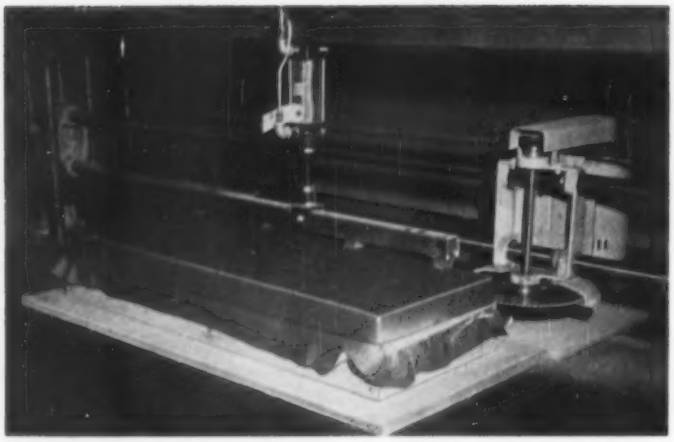


Fig. 21—In preparation for trimming the molded cover, the piece is placed over a wooden fixture and clamped to the saw table by means of an air cylinder

Fig. 22—Cutting of the molded piece is done with a 10-in., radially-carbide-tipped circular saw. The saw has 72 teeth with $\frac{3}{32}$-in. kerf and operates at 3450 r.p.m.

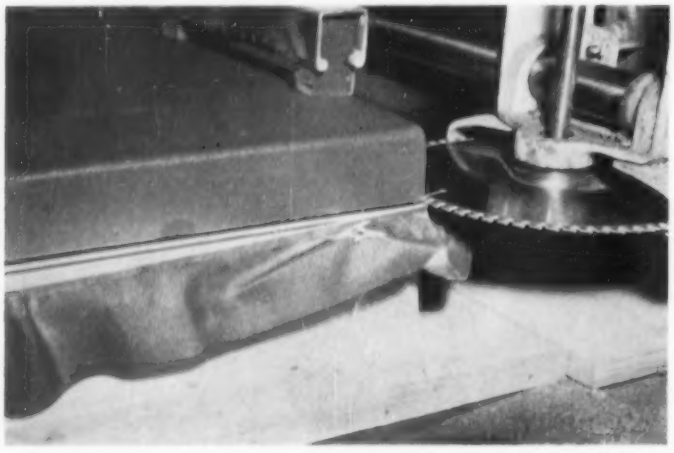
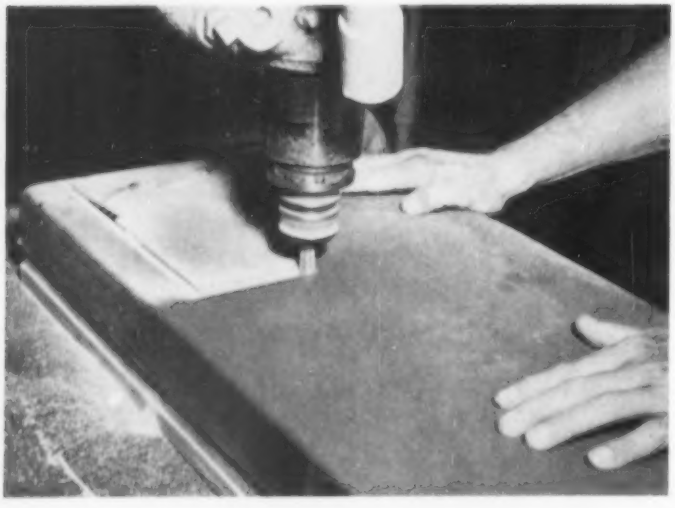


Fig. 23—Switch openings and access doors where necessary are routed into the laminate covers with a ½-in. dia., carbide-tipped router bit at 20,000 r.p.m.



tailored, or where draws exceed about 3 in., the use of a preform is necessary.

The authors tend to favor the use of mat wherever it is applicable because of lower scrap rate.

Use of a tightly bonded emulsion mat with higher binder content is more desirable than powder bonded mats, which tend to wash and wrinkle during molding and result in a distinct waviness on the surface of the vinyl.

Commercially available glass mats may vary in uniformity of glass distribution and/or binder distribution. Under full production conditions, quality control standards will have to be established between the glass mat manufacturers and the individual molder.

Swirl mat has been very effective in the process where washing can be controlled. However, fluctuation in binder content or poor distribution of binder can be fatal in this type of mat.

A major molding problem, outside of wrinkling and washing, has been "bridging" of the vinyl at corners. By way of definition, "bridging" is failure of the vinyl to conform to the cavity contour at corners. Bridging is a function of the vinyl Durometer hardness, vinyl thickness, resistance to stretch of the fabric backing, formability of the glass mat, resin viscosity, and molding pressure. Preheating, either of the sheet in its entirety or of local areas near the corners, aids in overcoming bridging. Where sharp corner radii make bridging a major problem, swirl mat should be used since it has better formability characteristics than random chopped-strand mat. Increased resin viscosity, which normally decreases resin richness on corners also helps to prevent bridging. Increased molding pressure is also advantageous in forcing the vinyl to conform to the cavity.

Temperature control has presented no special difficulties. Steel molds are cored in conventional manner. The cored molds are heated by the circulation of hot oil, maintained at a temperature slightly higher than the desired mold temperature to compensate for heat losses. Where cast aluminum tooling is used, the molds are heated by direct conduction from the platens. In this case, the press platen may be

(*To page* 228)

Extrusion Dies and Take-Off Equipment

An examination of design fundamentals

by KENNETH O. ROBBINS

EXTRUSIONS of profiles, pipe, tubing, and sheeting are coming more and more into demand. And as this demand grows, there is a corresponding increase in the need for special dies and take-off equipment to produce these items efficiently. But the trouble is that there is as yet no accumulated pool of "know-how" upon which to base the design of much of the specialized equipment which is required in an extrusion plant.

This lack of available proved data is especially noticeable in the case of extrusion dies. There are no exact formulas or methods which will give, for example, the amount of "pull-down" which will be encountered in extruding a complex or even a simple shape. The design of most dies built today is largely empirical, being based on experience gained from making dies of a somewhat similar shape, plus cut-and-try methods that are time-consuming and costly. Combine such die-making problems with the different results that are obtained when extruding different materials having different flow characteristics and it becomes easy to understand why no one extruder has been willing to spend the time and money required to try out innumerable die shapes with every extrudable material in order to arrive at foolproof die design formulas.

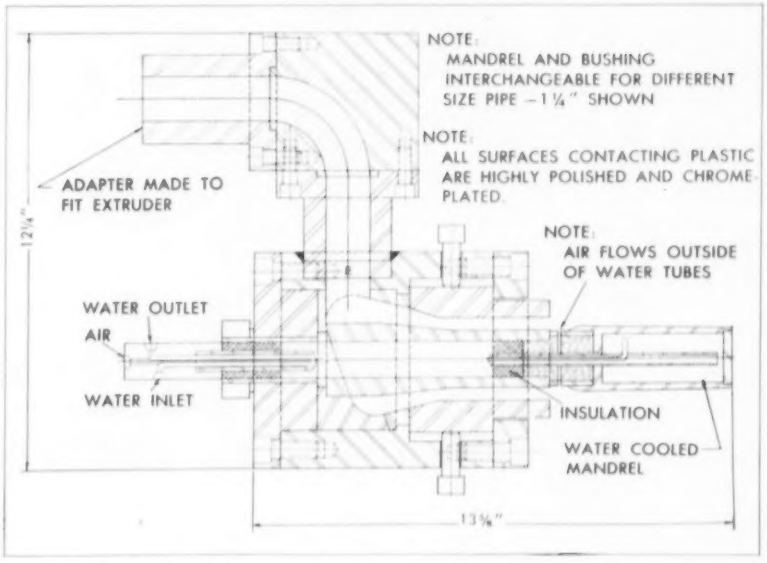


Fig. 1—Offset-type die for producing polyethylene, styrene, and butyrate extrusions

The present situation is that no one or two extruders have all of the "know-how" but each one has some; if all of these scattered design data could be pooled, everyone would benefit. To start the ball rolling toward this end, the author will set forth in this article complete data and formulas for designing several types of extrusion dies, together with the variations which must be observed when handling different thermoplastics.

Most Wanted Dies

Most common demand in our plant today is for dies to produce thin-wall rigid tubing in diameters from 2 to 4 inches. To meet this demand, an offset-type die has been developed which incorporates a water-cooled extension or mandrel. Two types of offsets have been worked out: one (Fig. 1) is for producing polyethylene pipe or thin-wall tubing, thin- or heavy-wall polystyrene tubing, and thin butyrate tubing and pipe; the other (Fig. 2) is for flexible and rigid vinyl products. The principle behind the die in Fig. 1 is that the material from the machine takes a 90° bend, goes to the die, and moves through a special flow chamber which is radiused and angled to get even flow around all sides of the mandrel. The offset eliminates all spider lines and provides a method of getting water in and out to cool the mandrel.

In running pipe and heavy-wall tubing in polyethylene, we use the method of spray-flooding the outside of the pipe with cool water as it comes off the extended mandrel. This can be done in a section of tank about 4 ft. long. We then like to immerse the pipe in refrigerated water (45 to 50° F.) in a tank, preferably 20 ft. long. From this tank, the pipe goes into a haul-off unit and then to either a coiling machine or an automatic cut-off saw, depending upon the use of the product.

In running butyrate pipe and

THE AUTHOR



Kenneth O. Robbins, in addition to being president of Robbins Plastic Machinery Corp., Elkhart, Ind., has traveled extensively abroad and supervised the installation of extrusion machines in many countries throughout the world. Mr. Robbins, a tool, die, and gage maker by trade, has been active in the plastics industry for over 15 years, during which time he has accumulated a large fund of knowledge concerning various aspects of the extrusion process.

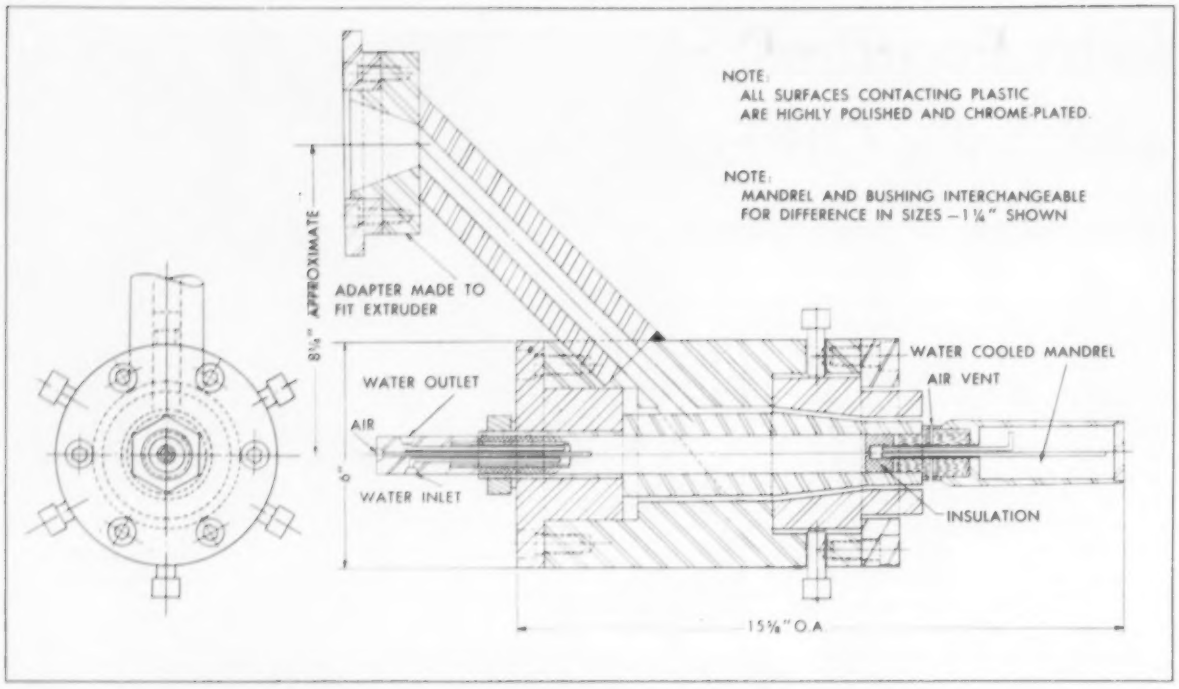


Fig. 2—Angular offset-type die used for the extrusion of flexible and rigid vinyl products

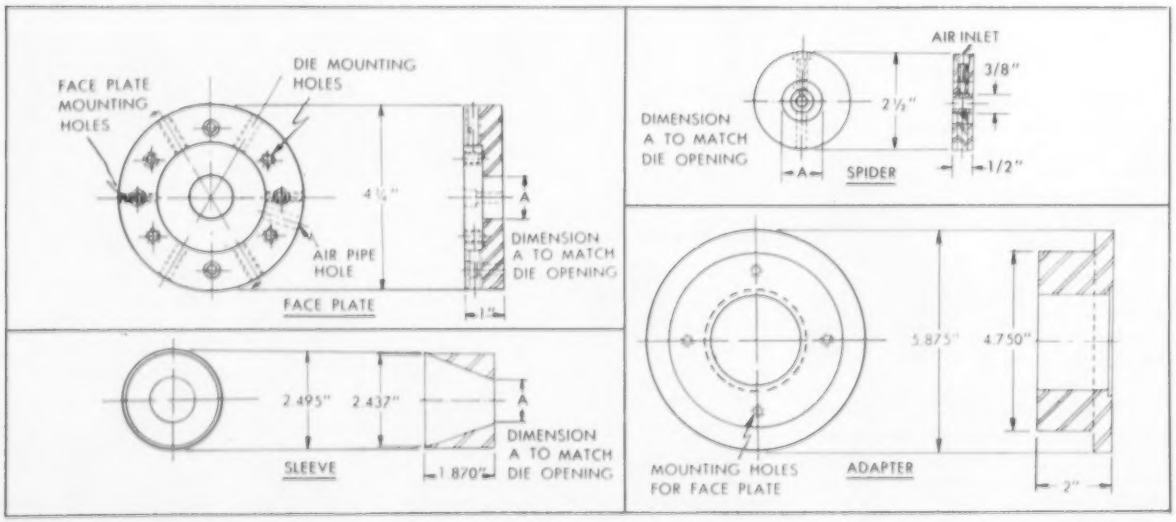
heavy-wall tubing, we have departed from the conventional method of air cooling on the inside and are now using the water-cooled extension mandrel with a provision for breaking the vacuum lock. The material is extruded over the mandrel and through a series of air-cooled step-down sizing rings. On sections where a spotty finish is not detrimental, we often use a water-cooled outside sizing ring to speed up the cooling process.

For flexible and rigid vinyl products, the angular offset die (Fig. 2) is used. This has a low-volume chamber through which the material travels at a high velocity under comparatively low pressure, so that the material will move fast enough to prevent burning. We have built and proved-out pipe dies based on this design, ranging from ½ to 8 in. in diameter and for various wall thicknesses. These include numerous thin-wall tube dies running as low as 0.002 to 0.003 in. wall thickness, 2 in. in diameter, and we feel that this is a much more efficient way of producing thin-wall tubing than by the air-pressure method.

Adapter Set-up

It is impossible to give specific formulas for the design of dies to produce shapes in vinyl, polyethylene, and other materials for refrigerator gaskets, window channels, T-rails, crib rails, etc., but a few general formulas that we use in our shop will be set forth as a basic starting point. However, to give a

Fig. 3—Diagrams of components of an adapter set-up as designed for a 2½-in. extrusion machine





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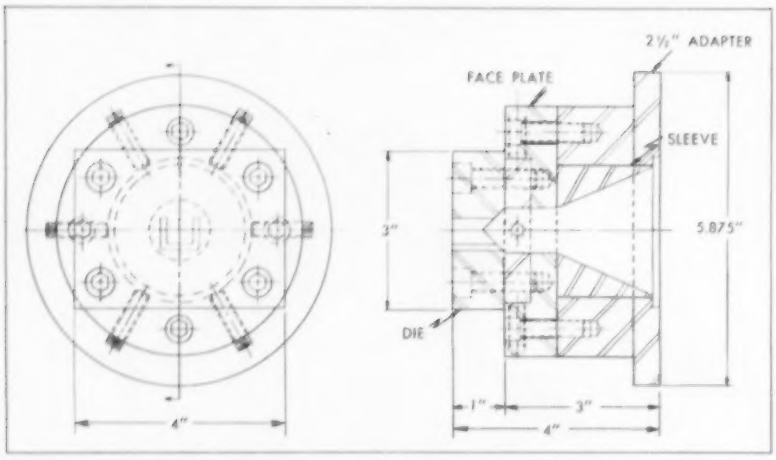


Fig. 4—Assembly of components shown in Fig. 3, adapted to a die for a U-shaped section

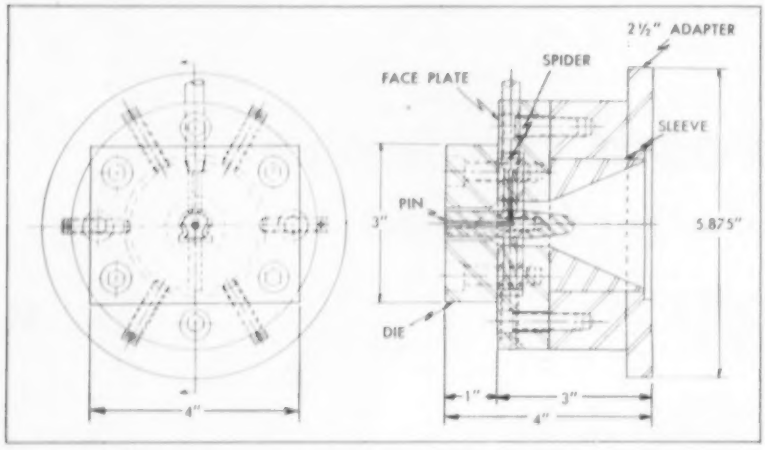


Fig. 5—Assembly of components shown in Fig. 3, adapted to a die for a hollow section

clear picture of how we design and build these dies, the adapter set-up which we have worked out should be explained first.

The description of this adapter will be confined to a 2½-in. extruder, since this is the size machine most widely used on small die work. Figure 3 shows the various components used in the adapter set-up. The basic die adapter is bored for a set of four sleeves. Each sleeve has a tapered hole, the large diameter of which is correct for a 2½-in. diameter screw and the small diameter (dimension A on drawing, Fig. 3) of which tapers down to either 1⅛, 1½, 1¾, or 2 inches. A set of four face plates are also made having the same *A* dimensions as the sleeves. All dies are then designed to fit one of the four adapter sleeves.

The face plates are counterbored to hold a spider or a ring, and the spider is adjusted by means of 6 screws. The die is then mounted on this plate and is easily changed so that just about any type of shape can be made with this basic set-up. Figure 4 shows an assembly of the components in Fig. 3 adapted to a die for a U-shaped section; Fig. 5 shows an assembly for a hollow section.

General Formula

The die shown in Fig. 6 is for a refrigerator or other gasket with a cushion. Our general formula is as follows: add 20% to the width, then add 35% to the over-all height in order to come out fairly well on the first attempt. Our "pull-down" rule of thumb on material wall thickness for dies of this sort is 0.001 in. for every 0.005 in. of uniform wall; however, if the shape has a heavy section, we often decrease the percentage.

Suppose, for example, a die is to be designed for the shape shown in Fig. 7. We would start out with a bulb diameter on our original die of 0.093 in. and would leave as much land on this section as possible.

On all gasket dies, wherever possible, we try to get the thinnest and largest sections balancing out in the middle of the adapter opening.

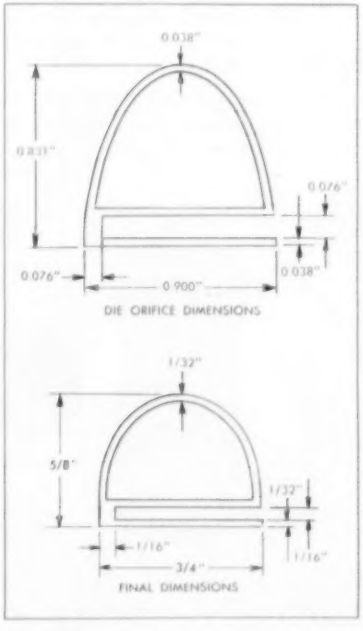
For window channels and similar shapes extruded of vinyl (Fig. 8), we increase the width by 20% and the height by 30%, allowing 0.001 in. for every 0.008 in. of wall that is uniform and 0.001 in. for every 0.007 in. of wall that is non-uniform.

On polyethylene shapes, we use the rule of thumb but increase the width 10% and the height 15 percent. Because this type of material can be run at almost any heat, we try to start out with these basic height and width increases but almost never increase any wall thickness until we have taken the initial shot on the die. We have found by experience that this is the fastest method of developing a polyethylene shape. After we take our first shot, it is almost always possible to tell what has to be done to perfect the die. Since our dies are designed in sections, it is a simple matter to change them and put them back on the machine. The percentage of dies that are successful on the second run of polyethylene is very high.

When designing dies for butyrate, acetate, and styrene, we add 20% to

(*To page* 133)

Fig. 6—For a gasket with cushion





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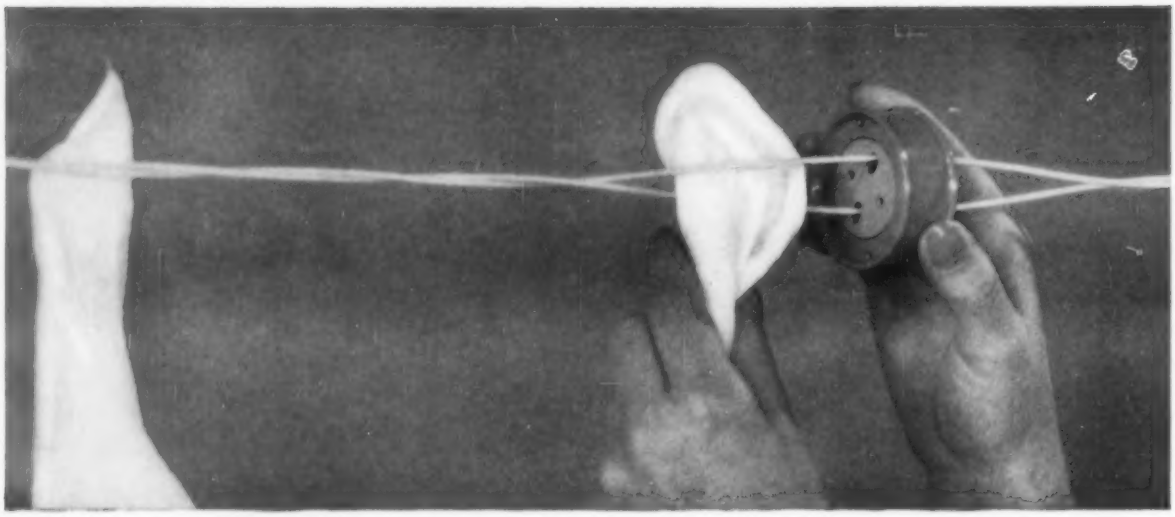
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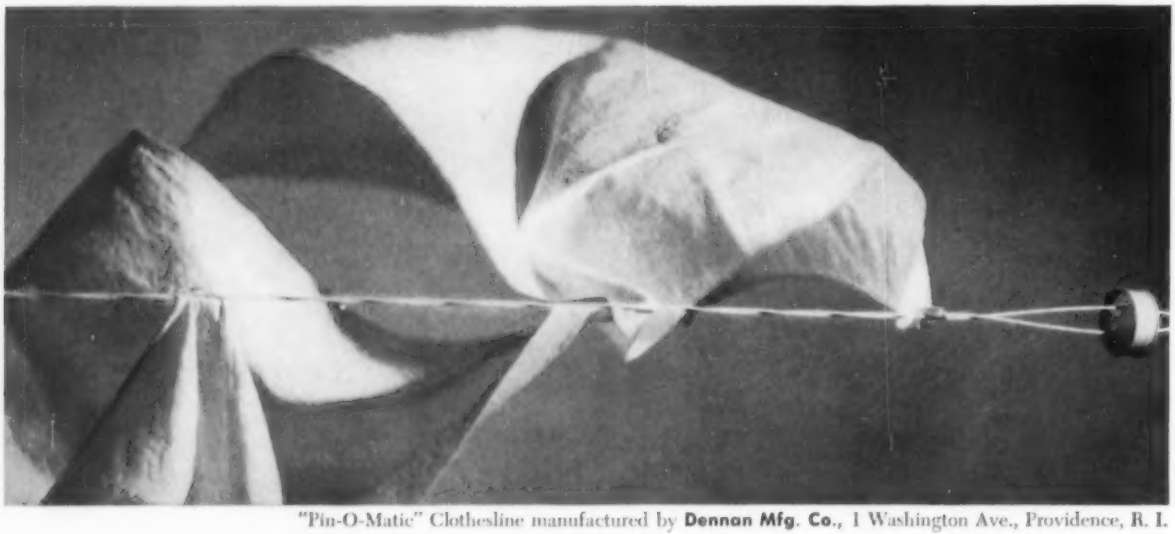
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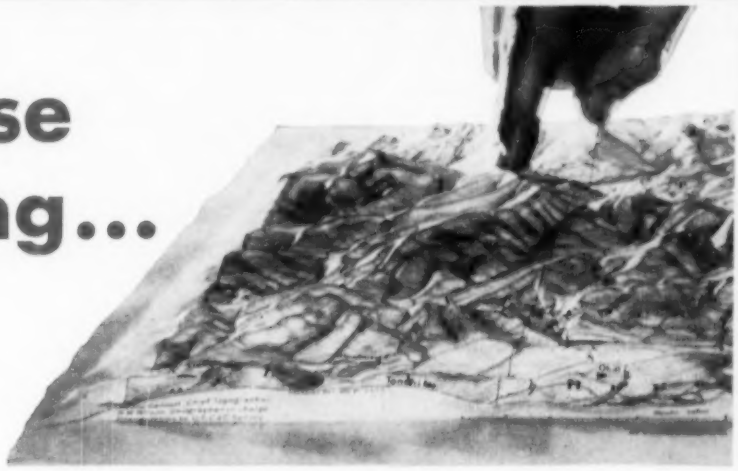
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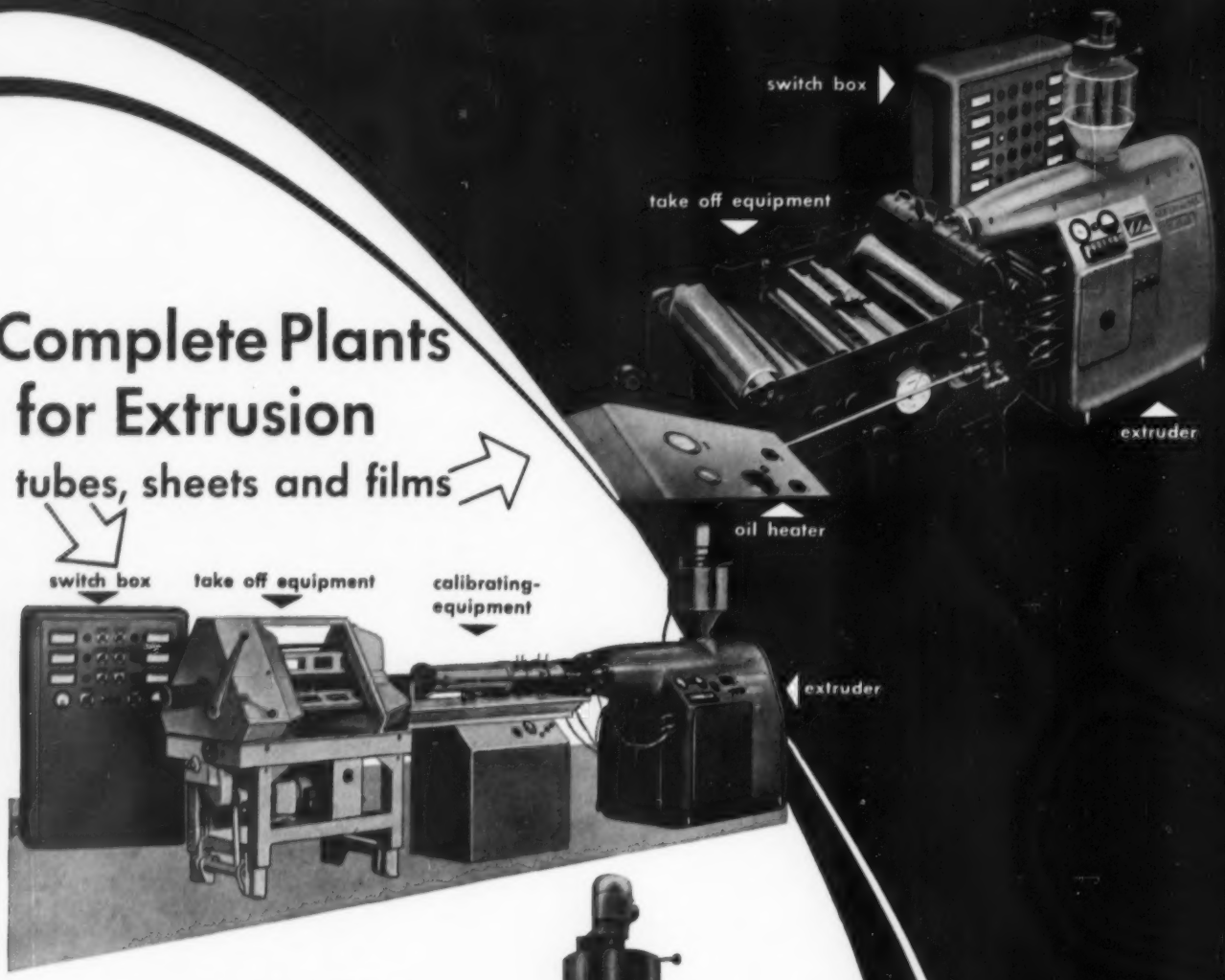
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height and width, keeping all uniform wall thicknesses as originally (Fig. 9) and decreasing all thicker sections at least 10 percent. We try the die and change accordingly.

When designing for rigid vinyl, either slightly plasticized or completely unplasticized, we start out basically with not over 1% pull-down (Fig. 10) and attempt to establish a uniform wall by decreasing the original wall thickness 0.001 in. for every 0.009 inch. This material is one of the few for which we feel it is absolutely necessary to chrome-plate all sections of the die that come in contact with the plastic material. We have tried stainless steel and various other non-corrosive metals but feel that the best dies can be made of mild machine steel which is then hard-chrome-plated.

Land Length

Important to high-volume extrusion with small shape dies is the length of land links—the straight sections of die between the taper from the extruder and the face of the die. Our rule of thumb on ordinary shapes is as follows: on vinyls, we leave about ½ in.; on butyrates, styrenes, polyethylene, and other materials, we leave from 1 to 1½ inches.

Some designers leave an extra long land on all shapes because they feel that this helps in controlling the extrusion. The merit in this type of die design is that less die work is needed and extrusions can be held to dimension with less careful extruder control. However, a lot of resistance to material flow is inherent with long lands and hence the output per hour is reduced. We feel that it is much better to spend more time on the finishing and testing of a die which will give maximum output per hour.

Sheeting Dies

Most of the high-impact styrene sheet extruded today is produced on a manifold type die (Fig. 11), in

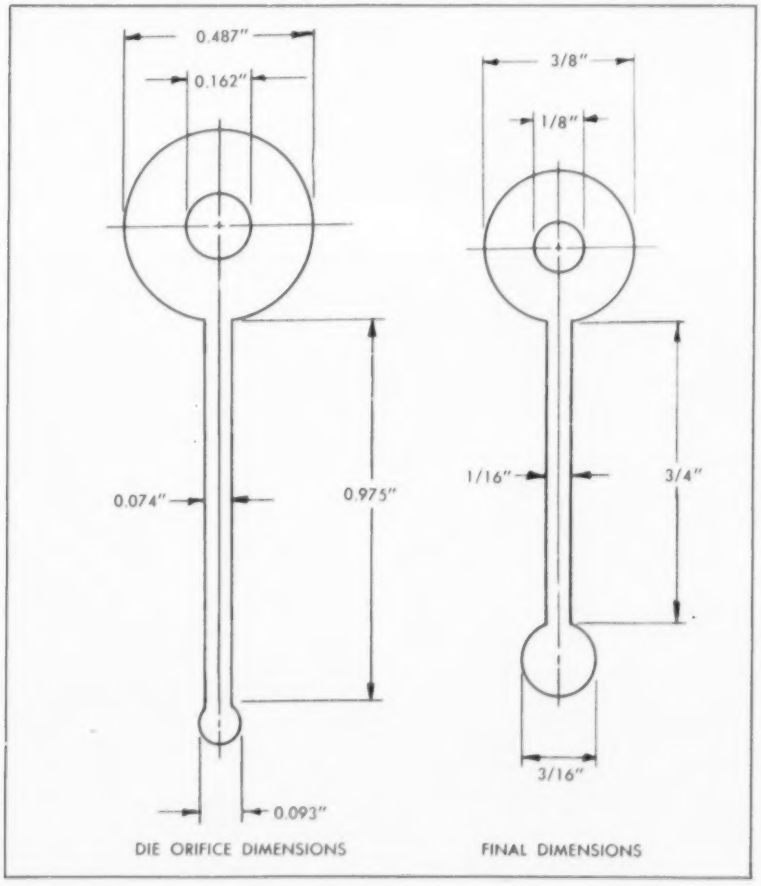


Fig. 7—Die orifice and final dimensions for a shape with a bulb (or heavy section)

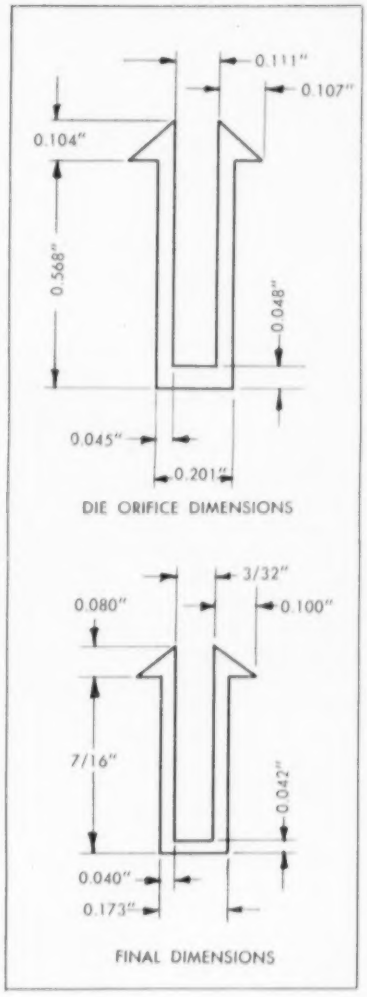


Fig. 8—For a channel shape

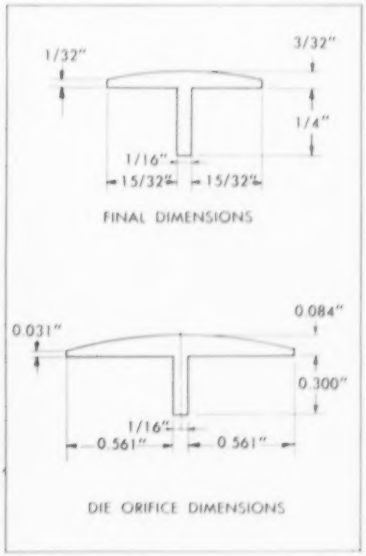


Fig. 9—For butyrate, styrene, acetate

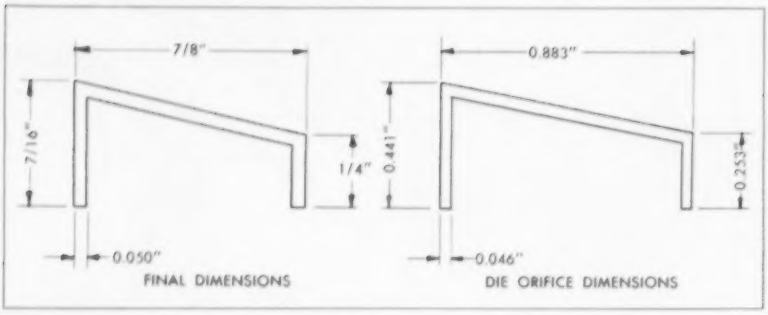


Fig. 10—Die orifice and final dimensions for a rigid polyvinyl chloride extrusion

which the material goes over and through a restrictor bar and emerges through adjustable die blades. The restrictor bar is designed so that it is about 0.020 in. higher in the middle than it is at either end. The die blades are adjustable by means of push and pull screws.

We have found that the most successful sheeting dies are the ones which are highly polished, chrome-plated, and polished again. The ends of these dies are fitted with plugs so that a dead pocket of material cannot accumulate in each end. By varying the lengths of these plugs, a 48-in. die can be converted so that it will produce much narrower sheet. We do not recommend this practice for large production runs but some extruders have successfully run this type of a die on all widths for 30 to 48 hours. However, if a large range of widths is to be produced, it is much better to have two or more dies available.

One of the essential things to remember in designing a sheeting die is that the width of the die blades should vary with the thickness of the sheet; the thicker the sheet, the wider the die blades.

Haul-Off

The rolls of any haul-off unit for sheet (Fig. 12) should impart a high finish to the sheet and should also cool it to some extent. Our rolls are chrome-plated and polished to a 2-microinch finish. These rolls are designed so that the heating or cooling liquid comes in at each end, passes to the middle, and thence to the inside roll surface, along which it flows back to the ends and then out. We feel that this method gives much more uniform temperature control than the method of putting the liquid in at one end of the roll.

We find it best to power the rolls of a haul-off unit with a separate variable speed drive in which the power is transmitted by means of a sprocket and chain to a jack shaft which in turn drives a worm gear. This gives great speed reduction with very uniform power output. By using a jack shaft, the speed of the machine can be changed at any time simply by changing the sprockets rather than going to the expense and time of changing gears.

Cutting the Sheet

From the pull rolls, the material can go through a shear (Fig. 13) which, controlled by an electronic eye, cuts the sheet to the required length, or it can be wound on a double-spool winder. Essential to good sheet production is a shear which travels with the sheet during the cutting step at the same rate of speed that the sheet is traveling.

Trimming or slitting arrangements can also be provided, and may be so designed that, when starting up or changing gage, the material will be cut into strips which are narrow enough that they can be fed directly to the scrap grinder, thereby eliminating sawing or cutting operations before grinding.

For materials over ⅛ in. in thick-

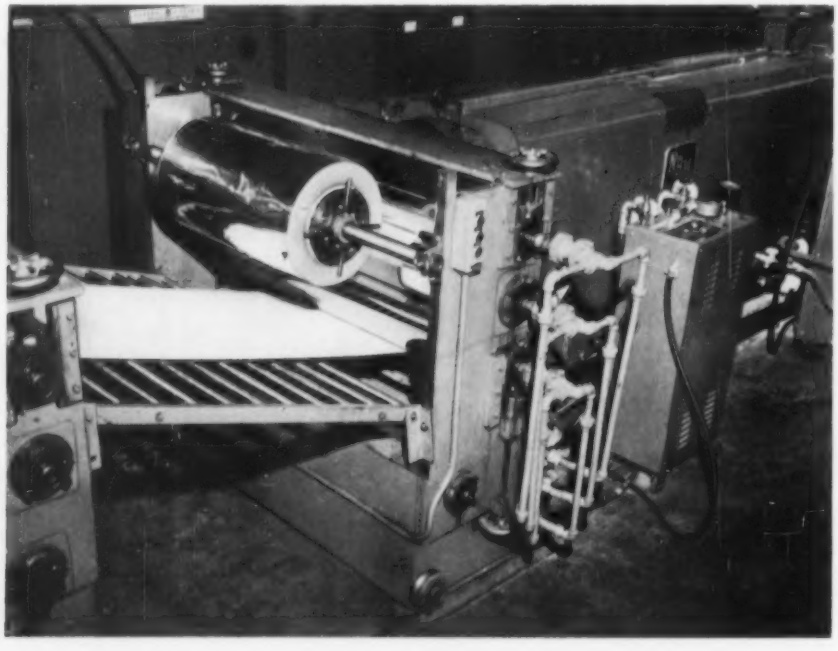


Fig. 11—Manifold-type die for the extrusion of high-impact styrene

ness, we prefer to use a traveling saw rather than a shear. This unit consists of a pair of rubber draw-rolls and a saw carriage that moves with the sheet at the same rate of speed as the sheet while the traveling saw is in the process of cutting the material.

After the material comes off the shear or the saw, it goes to an automatic stacking unit. When it is desired to run a material and wind it in rolls, it is only necessary to set the shear or saw to the "off" position, move the stacker out of the way, and set in a double windup stand.

Let's Have More

The foregoing paragraphs and the accompanying illustrations summarize the most important extrusion design fundamentals which have evolved through extensive experience with materials and equipment in the United States and abroad. They are given freely for the best interests of the industry. As stated previously, wide dissemination of correlated information is essential if extruders are to work together and to pool acquired "know-how" for the profit of all.

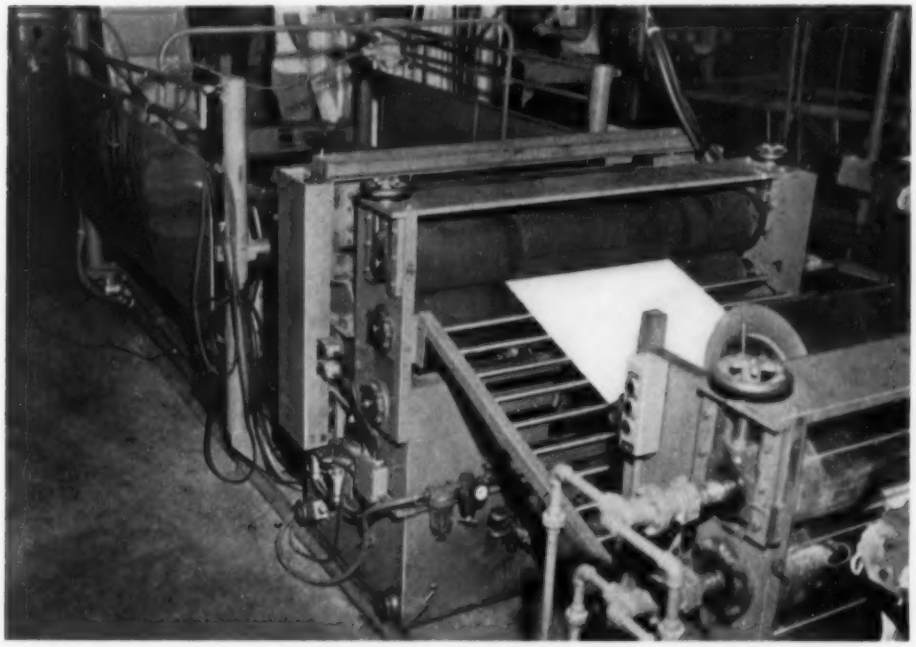


Fig. 12—Rolls of haul-off unit impart high gloss to sheet and at the same time cool it to some extent

All illustrations courtesy Robbins Plastic Machinery Corp.

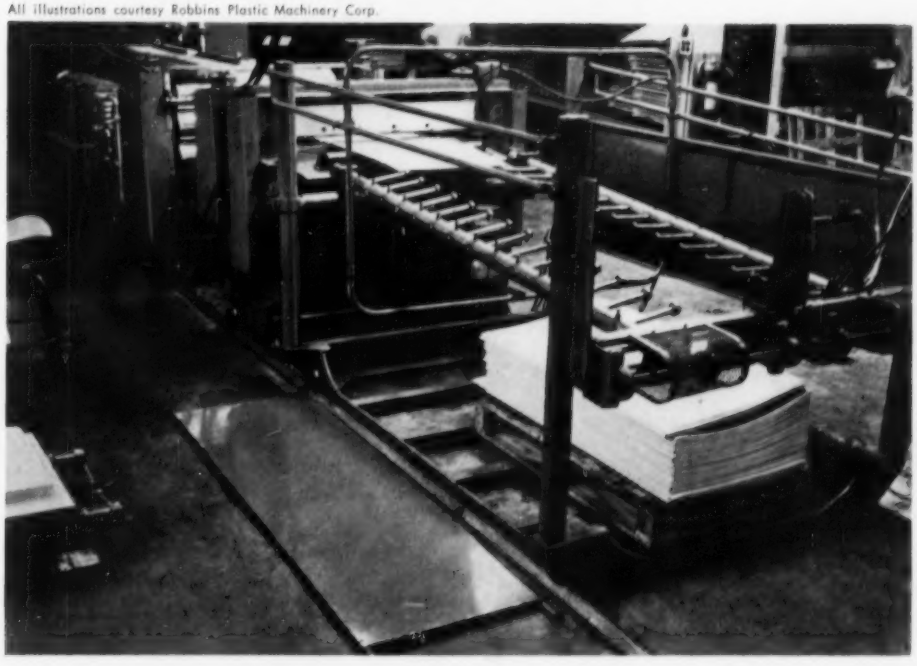
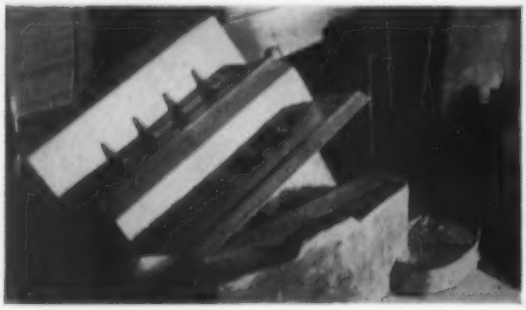


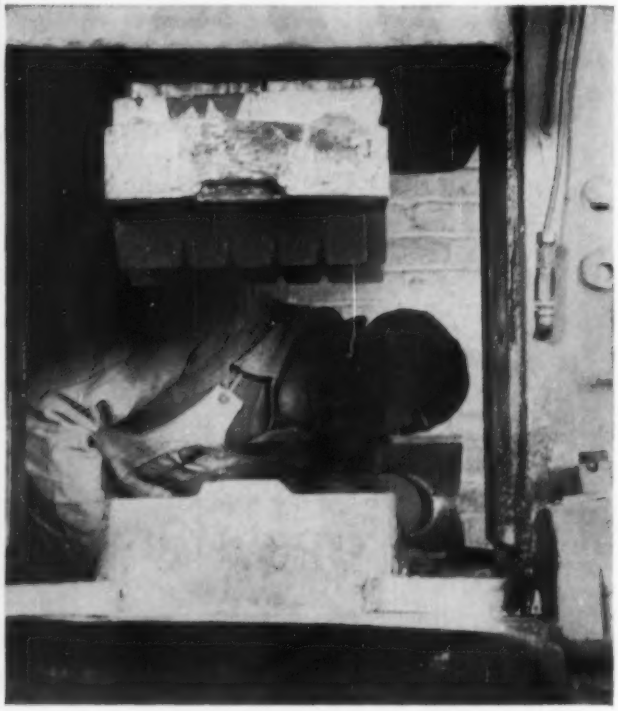
Fig. 13—Extruded material goes from pull rolls to a shear which cuts it to the required length



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PLASTICS*
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Torsional Properties of Plastics

by E. B. SHARP† and BRYCE MAXWELL‡

The torsional behavior of cellulose acetate, cellulose acetate butyrate, polystyrene, polymethyl methacrylate, and wood-flour-filled phenolic has been investigated. These studies together with tensile tests on the same materials supply the data required for the determinations of the elastic constants: shear modulus (G), Young's modulus (E), and Poisson's ratio (μ). The theoretical relationship between these three constants has been studied and compared with the measured values at various temperatures.

THE tensile modulus of elasticity of various polymers has been studied by many workers in the field. Various techniques have been demonstrated and the variation of this elastic constant with temperature (1)[1] and rate of straining (2) has been investigated. On the other hand, very few data are available in the literature on the shear modulus of plastics because of the difficulty of measuring this property.

Two methods of approach to this problem are available. One requires the direct measurement on a specimen subjected to a transverse shear stress. The difficulty in this case is in applying a direct shear stress and measuring the resulting shear strain. Such tests are subject to errors because of the stress distribution produced and the presence of bending stresses. The other method consists of applying a torsional stress and then measuring the torsional strain from which the shear modulus can be calculated. Technical difficulties are also involved in this method but they are not as serious as those found in the direct shear method.

Some studies on fatigue (3, 4), hysteresis (5), creep (6), and flexibility (7) in torsion have been carried out; however, very little information is available in the literature on the determination of the shear stress versus shear strain (twist) curves for plastics.

The tests presented in this report constitute studies of various plastics both in tension and in torsion and at various temperatures. These studies were made to determine the elastic modulus in shear and tension, the effect of temperature on these elastic properties, and the effect of combined stresses. From these data Poisson's ratio was calculated.

Basic Theory

The mechanics of the torsion test are described in many standard texts (8). For a hollow shaft in which the wall thickness is less than 0.2 of the outside diameter it is valid to assume that the shear stress is approximately uniform radially across the wall.

The shearing stress (τ) for a thin-walled hollow tube is related to the applied torque (T) by

$$\tau \cdot \pi \cdot \frac{d + d_i}{2} \cdot h \cdot \frac{d + d_i}{4} = T$$

Hence

$$\tau = \frac{8T}{\pi h (d + d_i)^2} \qquad \text{Eq. 1}$$

where h = thickness of the wall, d = outside diameter, and d_i = inside diameter.

If θ = twist/unit length and G = shear modulus, then the following expression obtains:

$$\theta = \frac{2\tau_{max}}{d' G}$$

where τ is assumed uniform and

$$d' = \frac{d + d_i}{2}$$

Thus:

$$\theta = \frac{4\tau}{G(d + d_i)}$$

$$G = \frac{4\tau}{\theta (d + d_i)} \qquad \text{Eq. 2}$$

or substituting from Eq. 1:

$$G = \frac{32\,T}{\pi h \theta (d + d_i)^3} \qquad \text{Eq. 3}$$

It is generally agreed that no plastic materials exhibit pure elastic response, but rather react to an applied stress by a combination of elastic response, retarded elastic response (configurational elasticity), and plastic flow. The last two mechanisms are time dependent; therefore, the measurements of strain must be made within a minimum of time after the application of the load in order for the response to be essentially elastic.

As the testing temperature is increased, the configurational elasticity and plastic flow become more rapid. If the slope of the initial portions of the stress-strain curves is used for determining elastic constants, this temperature effect will cause an apparent decrease in the moduli.

Poisson's ratio (μ) is defined as

$$\frac{\text{Unit lateral contraction}}{\text{Unit longitudinal elongation}}$$

and should be constant for a given material within the elastic limit. It can be determined by direct measurement on tension specimens or by

The research reported here was sponsored jointly by the Army, Navy, and Air Force under Signal Corps Contract No. DA-36-039-sc-133.
* Reg. U. S. Pat. Off.
† Development Laboratories, Bakelite Co., Div. of Union Carbide and Carbon Corp.
‡ Princeton University Plastics Laboratory, Princeton, N. J.
[1] Numbers in parentheses link to references at end of article, p. 144.

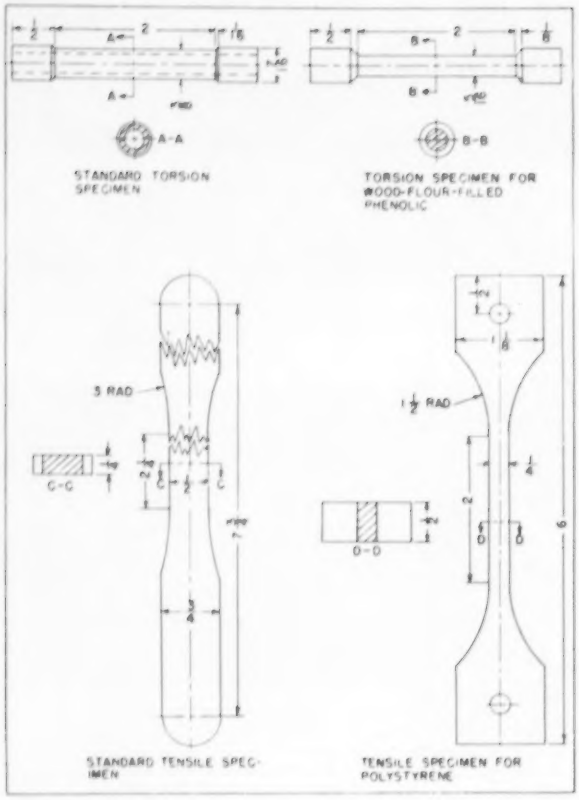


Fig. 1—Dimensions of specimens used in experiments

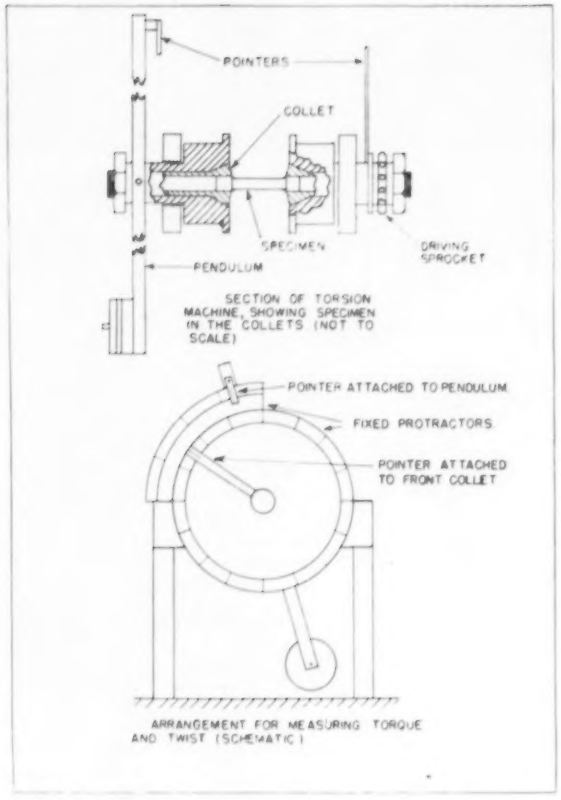


Fig. 2—Torsion machine and arrangement for torque and twist test

the indirect method of measuring the Young's modulus (E) and the shear modulus (G) and substituting in

$$G = \frac{E}{2(1 + \mu)} \qquad \text{Eq. 4}$$

This equation is only true for isotropic elastic materials. It can be shown that for such materials μ should be 0.25. Actually, for metals, considered to be isotropic, the values range from 0.303 for steel to 0.430 for lead.

Since μ measures the volume change on deformation, it follows that μ will be equal to 0.5 when no contraction occurs. For example, in liquids, where E equals zero and no contraction occurs under the influence of shearing stresses, Poisson's ratio must equal 0.5. This is in agreement with experimental results. The more the character of a substance approaches that of a liquid, the closer μ approaches this value.

Test Specimens and Equipment

The dimensions of the specimens used in these experiments are shown in Fig. 1. All of the torsion specimens, with the exception of the polystyrene, were machined from compression molded bars. The polystyrene was machined from a cast sheet. Because of the difficulty of drilling a long hole with a good surface in the wood-flour-filled phenolic, the specimens used for this material were solid rods.

In order to determine the effect of the shoulders at the ends of the specimens, test samples of polymethyl methacrylate were prepared with lengths from 1 to 2 inches. When these were tested it was found that for lengths of 1.5 in. or more, the effect of the ends was small enough to be neglected. It was finally decided to use a length of 2 inches.

The tensile specimens, except for the polystyrene, were of standard ASTM contour, machined from compression molded blanks using the same molding powders as for the torsion specimens. The polystyrene tensile specimens were machined from cast sheet.

The torsion tests were made on the machine shown schematically in Fig. 2. The specimen is held in collets with brass rods inserted into the ends of the specimen to prevent the walls from collapsing when the collets are tightened.

The front collet is rotated at 0.125 r.p.m. by an electric motor and gear reduction. Rotation is measured by a fixed protractor and a pointer attached to the collet.

The rear collet, to which is attached the loading pendulum, rotates in a bearing block which is mounted on wheels to eliminate any axial load. A pointer and protractor arrangement is again used to measure the rotation.

By using a pendulum to apply the torque, the rate of loading is not exactly constant (i.e., the torque is directly proportional to the angle that the pendulum makes with the vertical). However, by the proper selection of the weight on the pendulum for each material, it is possible to restrict the rotation of the pendulum to less than 45°. This portion of a sine curve is approximately a straight line.

For the combined stress tests, the axial load is applied to the rear col-

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let by a flexible cable connected to a simple lever.

In all of the torsion tests, the specimen was enclosed in a duct through which air was constantly circulated. The temperature of the air was maintained within ±0.5° C. by a thermoregulator and resistance heater.

The tensile tests were made on a 60,000-lb. Southwark-Emery universal testing machine, with a stress-strain recorder using a 2-in. gage length extensometer. A dial gage reading to 0.0001 in. was mounted

Table I—Tensile and Shear Moduli and Poisson's Ratio for Various Plastics

Material	Temp. C.	E p.s.i.	G p.s.i.	μ (calc.)	μ (meas.)
Polystyrene	30	496,000	190,000	0.305	0.334
"	50	435,000	166,000	0.310	0.293
"	70	360,000	137,000	0.315	—
Cellulose acetate	30	182,100	63,400	0.435	0.392
" "	50	97,600	35,400	0.380	0.416
" "	70	49,600	18,600	0.335	—
Cellulose acetate butyrate	30	185,000	63,400	0.459	0.416
" "	50	—	37,300	—	—
" "	70	—	21,300	—	—
Polymethyl methacrylate	30	430,000	159,000	0.351	0.337
" "	50	—	117,000	—	—
" "	70	—	83,000	—	—
Wood-flour-filled phenolic	30	1,050,000	345,000	0.480	0.485

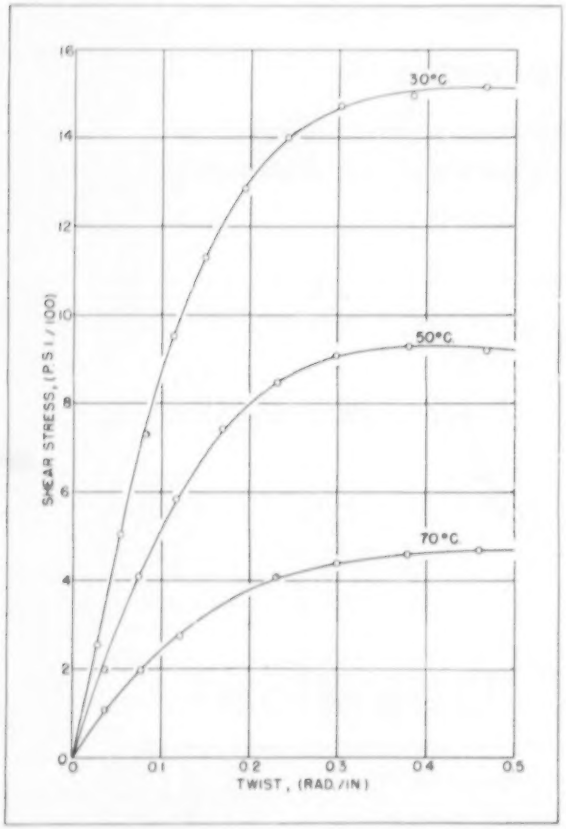


Fig. 3—Shear stress versus twist for cellulose acetate material at temperatures of 30, 50, and 70° C.

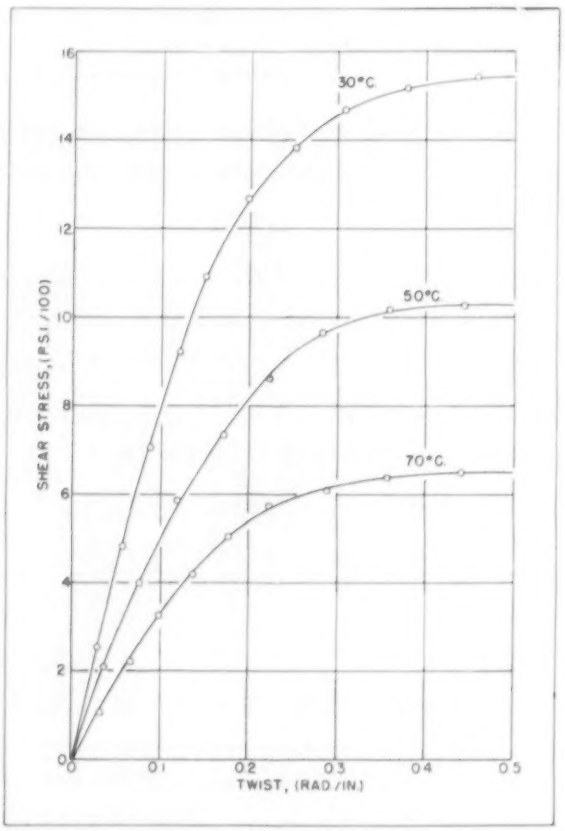


Fig. 4—Shear stress versus twist for cellulose acetate butyrate material at temperatures of 30, 50, and 70° C.



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on the specimen to measure the lateral contraction. The specimen was kept at the proper temperature by enclosing it in an oven equipped with a thermoregulator, blower, and heater.

Results and Discussion

The accompanying table and graphs are averages of at least three specimens at each condition. On the torsion tests, excellent reproducibility was obtained, with the differences between readings for different specimens being within the accuracy of reading the protractors.

Table I, p. 140, gives shear and tensile moduli for materials tested at various temperatures. Also in the table are given the values of Poisson's ratio as calculated from the moduli and as measured directly.

From Table I, it can be seen that increasing the temperature decreases the elastic constants for the thermoplastics tested. Temperature also seems to have some effect on the relation between the moduli (i.e., on Poisson's ratio). For the polystyrene tested, μ appears to increase slightly with temperature; however, this increase is within the experimental error. For the cellulose acetate, μ definitely decreases with increasing temperature. This means

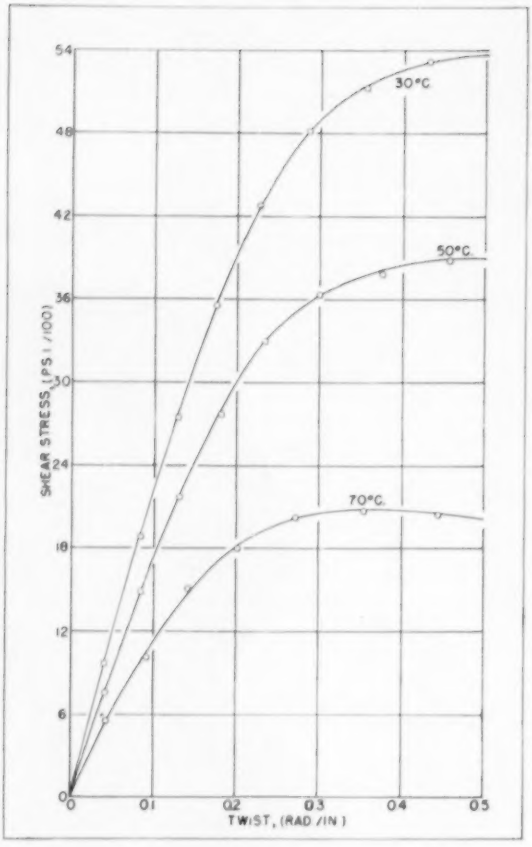


Fig. 5—Shear stress versus twist for polymethyl methacrylate at temperatures of 30, 50, and 70° C., respectively

that the tensile modulus is affected more by an increase in temperature than is the shear modulus.

The measurements of Poisson's ratio by the use of the dial indicator agree fairly well with those calculated from the moduli. Since the lateral contraction of the samples is small, these direct measurements are rather difficult to make and can serve only as a rough check on the computed values.

Figures 3, 4 (p. 140), and 5 show shear stress *vs.* twist curves for cellulose acetate, cellulose acetate butyrate, and polymethyl methacrylate, respectively. These curves are only carried out to the yield point, since beyond this point the walls of the sample collapse, thus making the data meaningless.

Figure 6 shows the shear stress versus twist curves for polystyrene. These tests were not carried out to the breaking point of the samples because, in order to do so, comparatively large torques are required and it is necessary to grip the samples quite tightly in the collets. This sets up a stress concentration at the

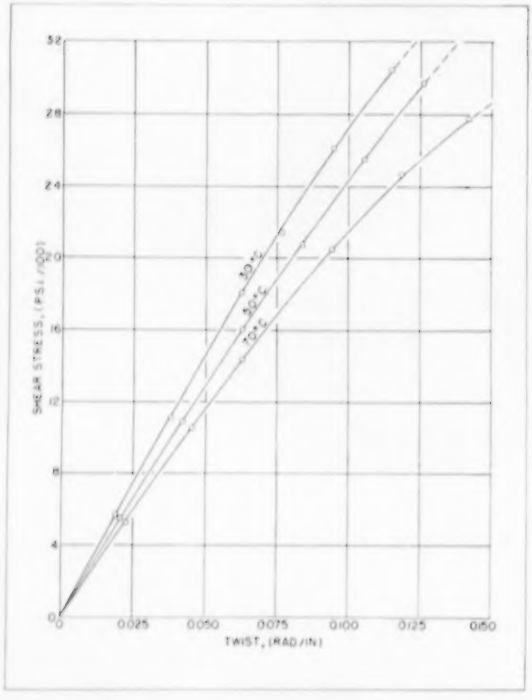


Fig. 6—Shear stress versus twist for polystyrene material at temperatures of 30, 50, and 70° C.

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shoulders of the sample, with the resulting tendency for the sample to shear off at these points.

As can be seen from these curves, the effect of increasing temperature is to lower the shear modulus and the yield stress for the thermoplastics tested.

Since the torsion specimens for the wood-flour-filled phenolic were solid rods, it is impossible to plot a curve of shear stress versus twist. Figure 7 is a plot of torque versus twist for this material.

The results of tests under combined torsion and tension on cellulose acetate are shown as shear stress versus twist curves in Fig. 8. As the axial load is increased, the apparent shear modulus and the yield point decrease as would be expected.

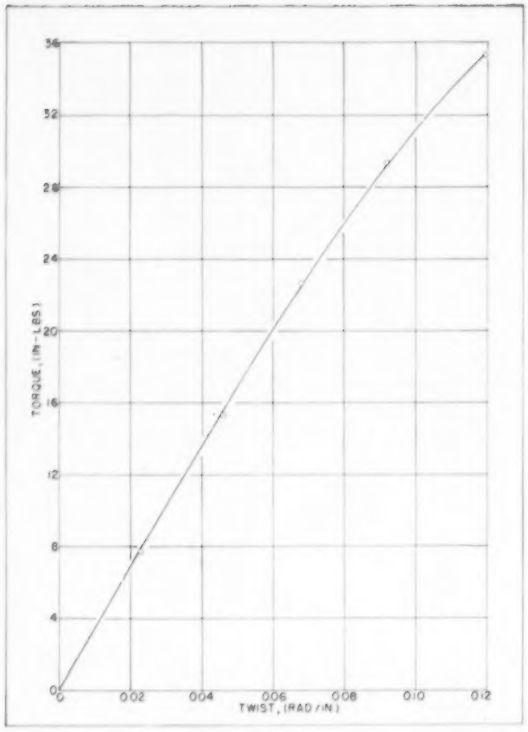


Fig. 7 — Torque versus twist for wood flour-filled phenolic material at a temperature of 30° C.

Conclusions

The values of Poisson's ratio at 30° C. calculated from measurements of the tensile and shear moduli have been checked against the values of μ found from direct measurement of the lateral contraction in tensile tests. The agreement is well within experimental error. Thus, the classical relationship between the elastic constants has been shown to hold for the common plastics.

It is interesting to note that of the thermoplastics tested, polystyrene most nearly approaches the behavior of a true elastic solid, that is, its Poisson's ratio (0.305) most nearly approaches the theoretical value of 0.25. On the other hand, Poisson's ratio for cellulose acetate butyrate (0.459) most nearly approaches the theoretical value for liquids.

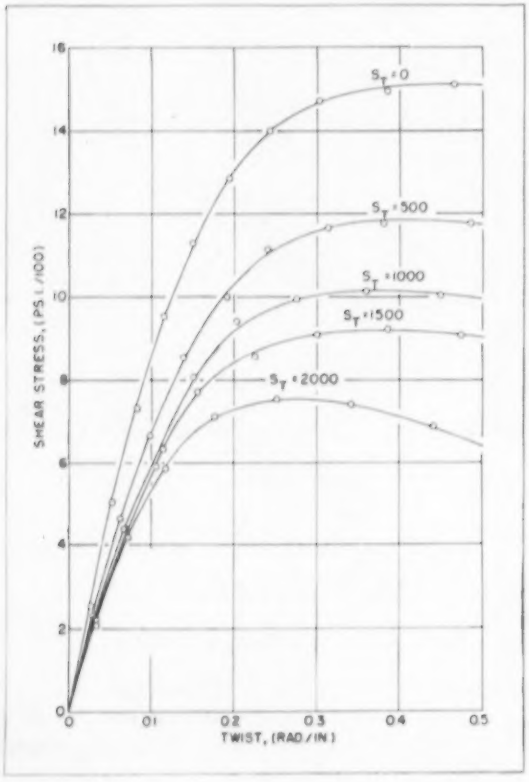


Fig. 8—Shear stress versus twist for cellulose acetate material with tensile stress as noted (p.s.i.) and 30° C. temperature

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Development of

Reinforced Plastics Pressure Vessels

for Chemical Corps Applications

by MILTON A. RAUN*

Results are given of tests conducted on glass-reinforced plastics pressure vessels developed for special Chemical Corps applications. Design and test criteria are presented, together with experimental data regarding bursting strength, volumetric expansion and permanent set under pressure, material fatigue, and other properties. While emphasis was placed on spherical-design vessels, plastic cylinders were investigated and some preliminary data obtained are included. Probable causes of failures noted are discussed. General conclusions concern the use of glass-reinforced plastics as materials of construction, particularly with regard to design and manufacturing considerations.

THE unique physical properties of fibrous glass-plastic composites have resulted in their widespread use for many commercial and military applications. In 1952, the Chemical Corps completed a study regarding the utilization of these materials for pressure vessels. The object of this study was to determine technical and economical feasibility of using reinforced plastics pressure vessels for lightweight portable flame throwers. Three major conclusions were established by this study:

1. Plastic pressure vessels could offer significant advantages in the application cited. Notably, these are elimination of corrosion problems; better protection for the operator of the flame thrower; and a potential reduction in weight in comparison to metal pressure vessels of similar capacity.

2. Upon completion of design and engineering aspects, industrial facilities would be available to manufacture plastic pressure vessels.

3. Although no satisfactory plastic pressure vessels had as yet been commercially produced, the physical and mechanical properties of glass fibers and available plastic resins indicated that development of suitable items was technically feasible.

Based on these conclusions, a development program was initiated and design and test criteria were established for spherical and cylindrical shapes of reinforced plastics pressure vessels.

During the course of this program both spherical and cylindrical reinforced plastics pressure vessels were evaluated. Although not entirely satisfactory, prototypes have exhibited most of the desired characteristics specified by design criteria. Test data compiled indicate certain areas wherein further development effort is required, particularly as regards designing to gain advantages inherent in reinforced plastics.

While the preponderance of detail test data accumulated by the Chemical Corps centers about spherical vessels, extensive development and testing is in progress on cylindrical reinforced plastics pressure vessels. Effort is directed to investigating parallel and angular winding of glass fibers, roving, and lamination of mat and cloth. Other areas being investigated regarding these pressure vessels include the use of various liners of plastics or metals, the use of metallic or other reinforcing components, and the study of polyesters, epoxies, and other binding resins. As can be noted from the broad scope of this program, the field of plastic pressure vessels covers many areas and, of necessity, this presentation is primarily limited to the data accumulated in evaluation of spherical reinforced plastics pressure vessels. The results of work to date on cylindrical plastic pressure vessels is not complete and, therefore, cannot be fully reported.

* Chief, Materials Development Branch, Chemical Corps Chemical & Radiological Laboratories, Army Chemical Center, Md.

This paper was presented at the 1955 Spring Meeting of the American Society of Mechanical Engineers.

For the spherical vessel, requirements established were as follows: an internal capacity of 223 cu. in.; a maximum diameter of $7^{13}/_{16}$ in.; an operating pressure of 2000 p.s.i.; test pressure of 3500 p.s.i.; a minimum burst pressure of 6000 p.s.i.; and incorporation of a 1-in. pipe connection.

Additional Criteria

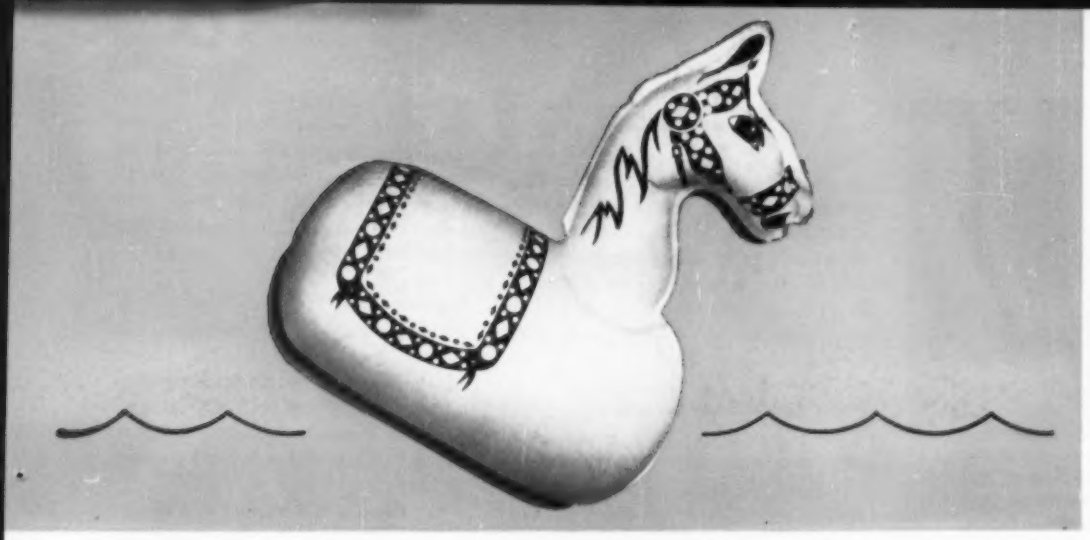
The foregoing physical test requirements were based on the current performance of like items of a metal construction. In addition to these criteria, it was required that the spherical plastic pressure vessel achieve a reduction in weight of 25% or more over the comparable metal units which weigh 6 lb. and that the plastic sphere resist shattering when subjected to the impact of .30- or .50-caliber projectiles fired into a pressurized unit.

Subsequent to establishment of the foregoing criteria, additional technical requirements were found necessary for complete acceptance of a plastic pressure vessel. These were ability to withstand pressure cycling of 2000 times at 2500 p.s.i. and tests of pressurized units at ambient temperatures of −40 and +160° F. These additional detail criteria arose from storage requirements as well as functional considerations.

Preparation of Vessels

Utilizing the design and test criteria established, 24 fibrous glass-reinforced plastics spheres were obtained by the Chemical Corps for evaluation and tests. The items differed from each other only in that three different sizes of thread openings were used for the pressure connection in order that this design criterion might be evaluated.

The spheres consisted of an aluminum shell or liner (0.058 in. thick) covered by a reinforced plastics shell formed by winding strands or roving of glass fiber on the liner and impregnating with resin. The glass

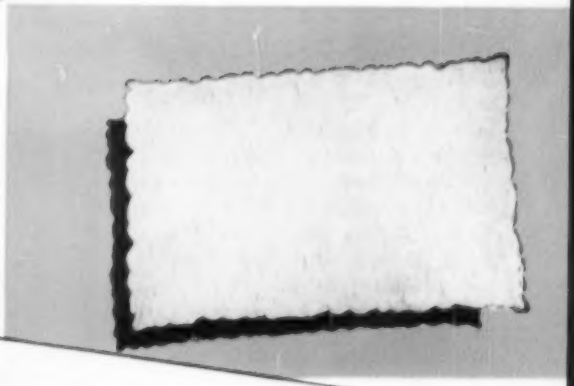


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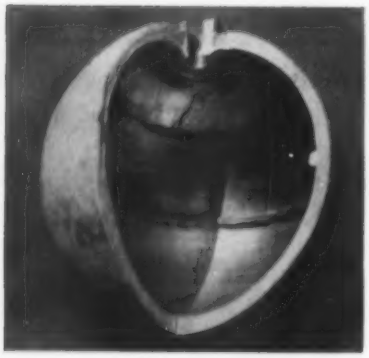


Fig. 1—Quarter-sectional view of prototype reinforced plastics spherical pressure vessel. Note heavy band along inner aluminum liner weld line



Fig. 2—Typical rupture in reinforced plastics sphere pressurized to 9000 p.s.i. during hydrostatic rupture test

fiber and resin shell varied in thickness from about ¼ in. in most sections to over 9/16 in. at the pressure connections and at the pole opposite this on the sphere. A polyester resin was used as the impregnating or binding material, being brush-applied during the winding of the glass fibers. Each roving wound around the shell was formed of 12 strands in which each strand consisted of 204 filaments. The filaments of glass fiber each measured from 0.00038 to 0.00039 in. in diameter.

The aluminum liner was fabricated by welding together circumferentially two spun hemispheres. The pressure connection was joined to the inner surface of the aluminum liner by an epoxy adhesive. This inner liner was made of 3SO aluminum; the connection, from 61s aluminum. Figure 1 shows a sectional view of a prototype vessel.

As previously stated, the spheres were separated into three groups, differing only in the internal thread size of the pressure connection. The average weight of the 24 spheres was 4.45 lb. each and the average capacity was 192.95 cu. in. per unit, which gave a capacity-weight ratio of 43.2 cu. in. per pound. The outside diameter of each sphere was approximately 7¾ inch.

Water Absorption and Leakage

The Chemical Corps procedures used for evaluation of reinforced plastics spheres are common to the developmental testing of any prototype pressure vessel for similar applications except that a water absorption test would not be needed on metal construction. Thus, in evaluating plastics spheres, it is convenient to draw comparisons with steel and aluminum pressure spheres.

Utilizing the 24 plastic spheres produced as development prototypes, pressure tests were made to determine water absorption of the plastic and leakage, hydrostatic rupture and air-rupture strength, and fragmentation of the items.

Water absorption of the material used was determined as 0.14% based on weight increase of spheres immersed in a 25° C. water bath for a period of 48 hours.

The leakage test consisted of first subjecting each of the 24 spheres to a hydrostatic pressure of 3500 p.s.i. The spheres were then retested with an air pressure of 2000 p.s.i. while immersed in a water bath. Seven spheres were found to leak, of which two showed penetration at pressures between 200 and 500 p.s.i. and the additional five at 200 p.s.i. In all cases, the leakage was small and originated at the junction of the pressure connection and liner.



Fig. 3—Fragmentation of reinforced plastics sphere when pneumatically ruptured at pressure of 7800 p.s.i.

Bursting Tests

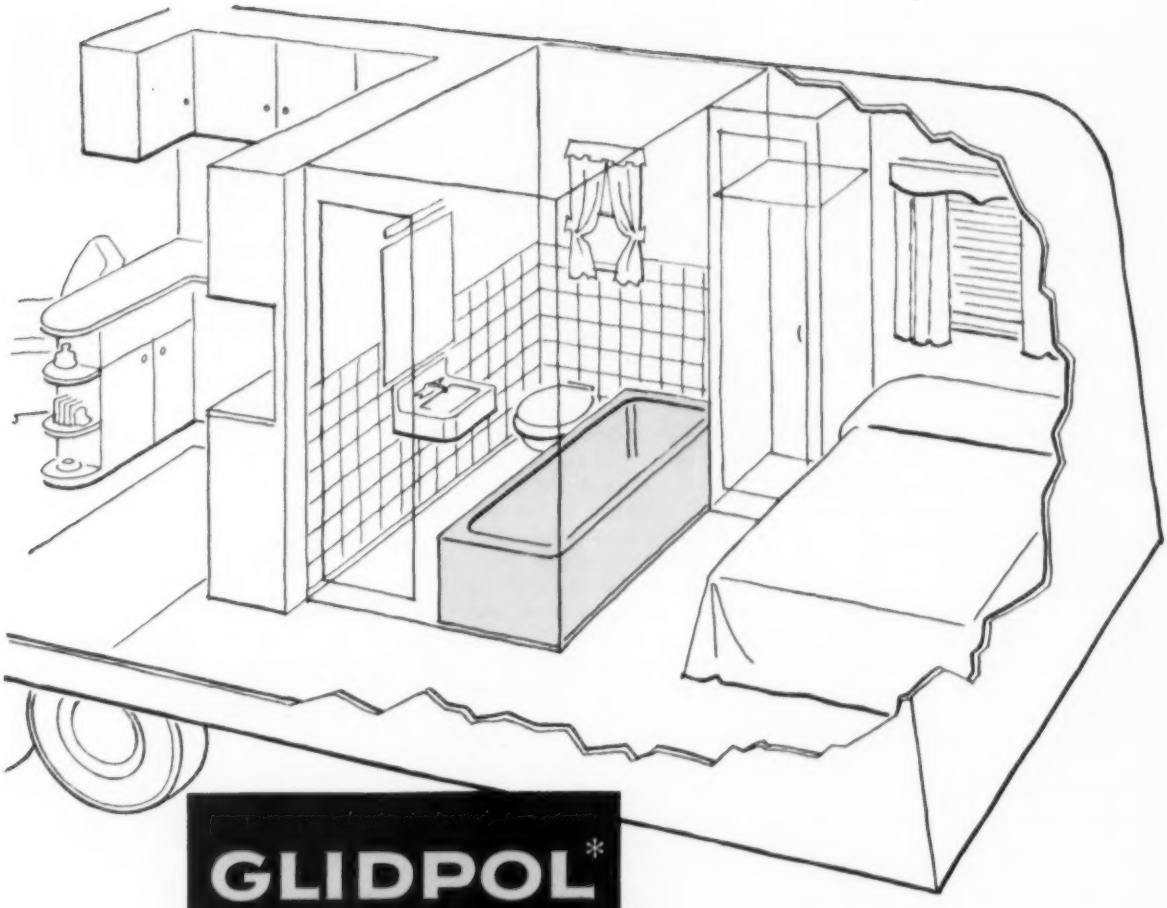
Ultimate bursting strength was determined by subjecting four spheres to hydrostatic rupture test at room temperature. The spheres ruptured between 7800 and 9000 p.s.i. Figure 2 illustrates a typical rupture at 9000 p.s.i.

To observe the nature and extent of fragmentation due to pneumatic rupture, one sphere was pressurized to destruction with air. The sphere ruptured at an ultimate pressure of 7800 p.s.i. In bursting, there was no tendency for the sphere to fragment completely. The glass fiber-plastic outer section of the sphere was torn extensively, but still held together. The inner aluminum liner was also badly torn and had separated from the plastic covering. However, with the exception of one small fragment and the spud, the item remained essentially in one piece. Figure 3 shows the extent of this fragmentation.

Volumetric Expansion

Volumetric expansion tests are generally employed in evaluating metallic pressure vessels for elastic limits of materials. A means of establishing the data is by determining permanent set of the vessel after it has been pressurized. This indicates, of course, whether the materials were stressed beyond elastic limits. The Interstate Commerce Commission specifies that ICC-3A steel pressure vessels shall not have a permanent set exceeding 10% of the total expansion under test pressures. However, there is no established criterion specifically governing allowable permanent set for plastic vessels. Because of the inherent characteristics of plastic materials, it was thought their elastic limits might prove their application more limited and of a different scope than metal vessels. Thus, volumetric expansion tests of the plastic spheres were conducted to provide data useful for establishing definite criteria correlating this factor with usage requirements of such items.

To determine the volumetric ex-



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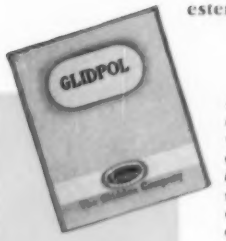
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Table I—Volumetric Expansion of Different Types of Pressure Vessels

Type of pressure vessel	Increase in Volume at 2000 p.s.i.	Increase in Volume at 3500 p.s.i.
	%	%
Glass fiber sphere	0.832	1.593
Steel cylinder	0.256	0.433
Steel sphere	0.209	0.376
Aluminum sphere	0.319	0.598

pansion and permanent set of the reinforced plastics spheres as compared with metal pressure vessels of similar capacity, a series of tests were made on a reinforced plastics sphere, a steel cylinder, a steel sphere, and an aluminum sphere. Each of these was subjected to a water jacket test, wherein the vessel is pressurized while totally enclosed in a water tank from which the only outlet is to a calibrated burette. With water level established at a predetermined zero point on the burette, pressure is applied to the vessel and the increase of volume due to expansion measured. The pressure is released and the burette observed for any residual increase in volume caused by permanent deformation of the vessel. The permanent volume increase is referred to as "permanent set," and is expressed as a percentage value when compared to the total increase in volume obtained when the vessel was under test pressure. The results of this test are given in Table I. No permanent set was observed in any of the vessels when test pressure was released.

Fatigue Tests

Fatigue pressure tests were next conducted to determine the fatigue life of the plastic spheres under repeated pressurization cycles. A hydraulic fatigue tester was used as shown in Fig. 4. As shown, the sphere is assembled to the fatigue-test device adjusted to apply a cyclic pressurization ranging from 0 to 2000 p.s.i. at the rate of 22 cycles per minute. After 470 cycles, a drop in pressure was noted on the pressurizing stroke, indicating a fatigue failure of the sphere being tested. A visual examination disclosed that oil was leaking from minute holes in the plastic covering of the sphere. An attempt was then made to rupture the sphere hydraulically. However, when a pressure of 4000 p.s.i. was attained, the capacity of the hydraulic pump was not sufficient to overcome the porosity of the sphere. Subsequently, the sphere was sectioned for examination which disclosed a fatigue crack at the weld joint.

To observe effect of impact on materials, a sphere pressurized to 2000 p.s.i. with air was drop-tested from a height of 6 ft. to impact on a concrete surface. There was no visible damage to the item nor signs of leakage. The sphere was then subjected to the fatigue test described. After 465 pressure cycles, oil was observed leaking through the plastic shell. Sectioning of the sphere again showed a failure at the weld joint of the aluminum liner.

Subsequent fatigue tests were modified so that the cycle rate was reduced to 10 pressure cycles per min. to simulate more nearly the fatigue test rate used by manufacturers of steel pressure vessels (500 cycles per hour). In addition, the water jacket test was incorporated into fatigue testing so that progressive permanent set occuring in the spheres prior to stress failure could be noted. The water jacket device was installed so that observations could be made without stopping the cycling machine.

Two spheres were tested at the rate of 10 pressure cycles per min. with a maximum working pressure of 2100 p.s.i. Failure of the first sphere occurred after 250 cycles when a crack developed in the liner at a point near the junction of the outer diameter of the spud flange and the liner. A permanent set of 1.42% was measured at 200 cycles. The breakdown of the second sphere occurred after 812 cycles when a crack developed along the circumferential weld of the liner. This sphere had developed a permanent set of 10.81% at 300 cycles (as compared with the maximum of 10% established by ICC for steel pressure vessels). A permanent set of 12.82% was recorded at 800 cycles.

To obtain data on the effects of higher pressures, two spheres were subjected to a fatigue test at a maximum pressure of 2600 p.s.i. One sphere failed at 154 cycles and the other at 280 cycles. The location of the failure was similar for both spheres in that it developed in the circumferential weld of the liner. Less than 1% permanent set was noted in one case.

Storage Tests

Effects on the physical characteristics of materials when subjected to various climatic storage conditions are of prime interest to the military. The effect of cold temperature upon plastic spheres was investigated by subjecting an unpressurized sphere to a temperature of −65° F. for a continuous 48-hr. period. At the end of this time and while at −65° F., the unpressurized sphere was dropped from a height of 4 ft. to impact upon a concrete

(*To page* 154)

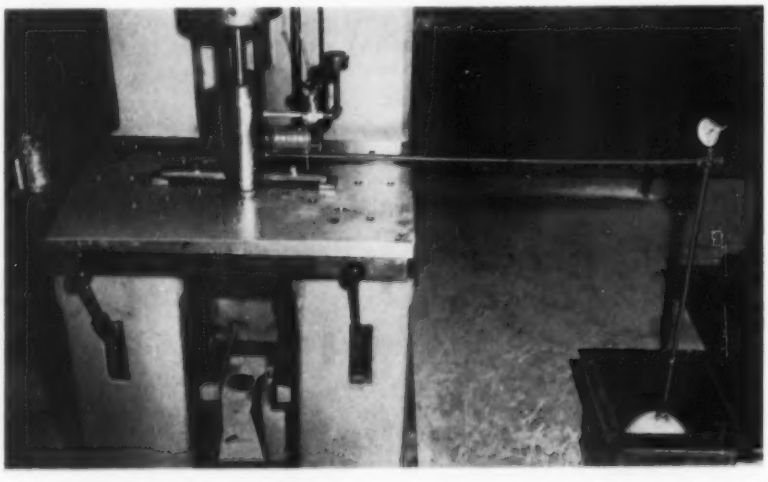


Fig. 4—Hydraulic test apparatus used for the cyclic pressurization of reinforced plastics spheres in experiments aimed at determining fatigue resistance of such spheres



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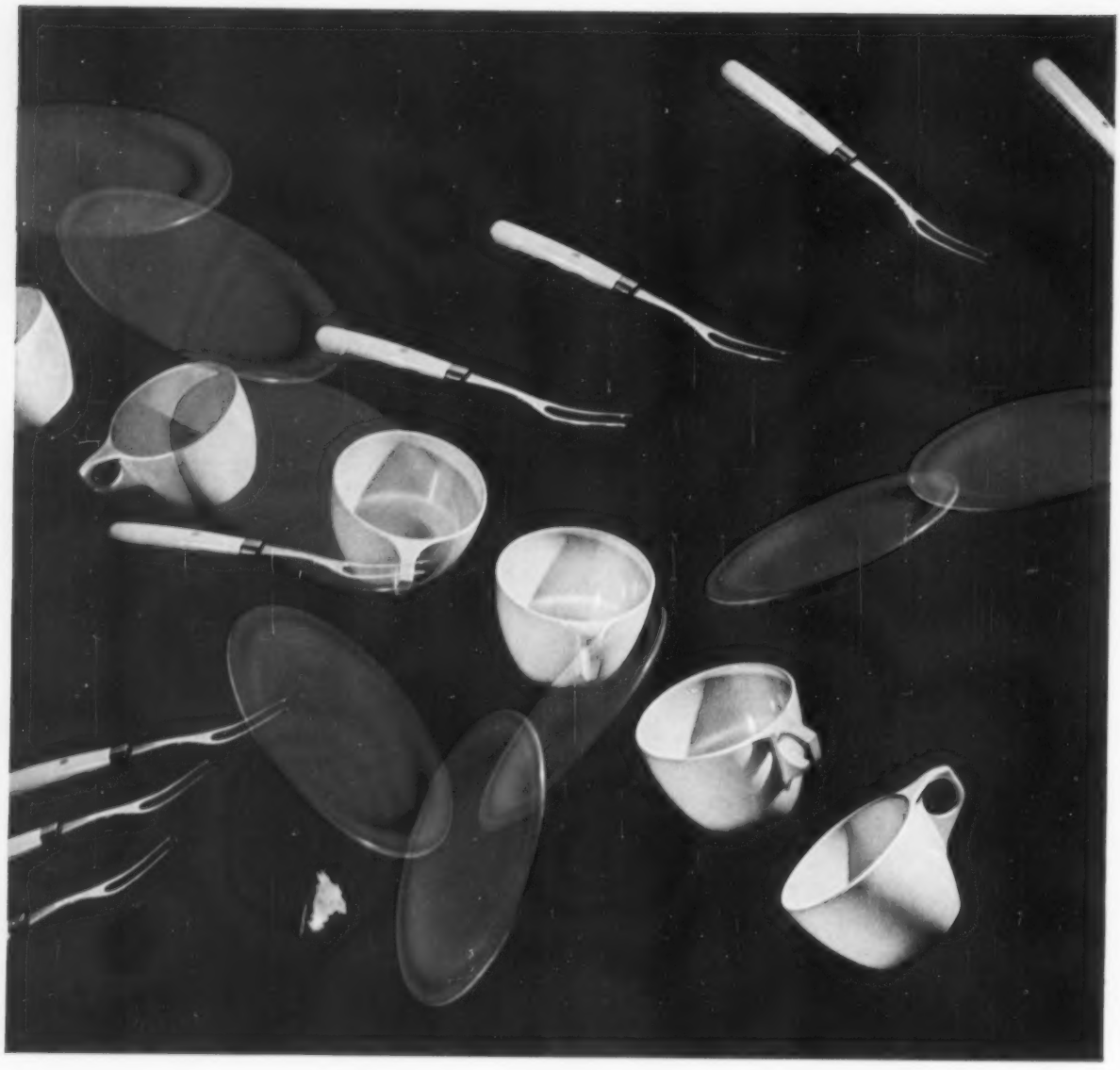
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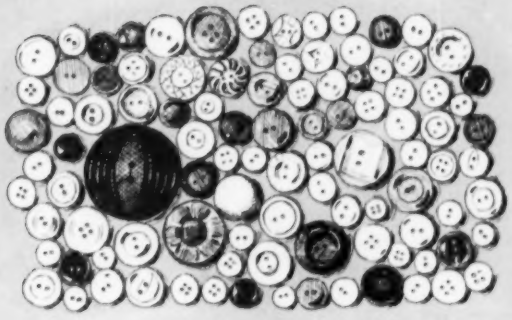
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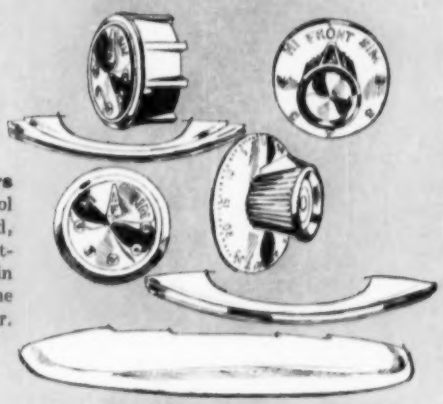
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surface. No visible damage was noted as a result of this test.

Following this drop, the sphere was filled with kerosene and placed in storage at a temperature of −40° F. for 24 hours. At the end of this period while still at −40° F., it was hydrostatically ruptured. The ultimate bursting pressure was observed to be 10,250 p.s.i., which was somewhat higher than obtained with spheres ruptured at normal temperature. The type of rupture was similar to that illustrated by Fig. 2.

To determine the effects of elevated temperatures upon plastic pressure vessels, an unpressurized sphere was stored at a temperature of 125° F. for 24 hours. It was ruptured hydrostatically at the storage temperature and failed at 7000 p.s.i.

To ascertain the effects of climatic extremes upon pressurized plastic spheres, four spheres were filled with air to 2000 p.s.i. and subjected to simulated storage conditions. Before storage, volumetric expansion was obtained for each sphere. This was for comparison with similar information to be taken after storage. One each of the four spheres was stored for 28 days at each of the following conditions:

a. 160° F. (desert storage)
b. 113° F. and 85% R.H. (tropical storage)
c. −65° F. (arctic storage)
d. Alternate storage of 1-week duration each at 165 and −65° F. (cyclic surveillance)

During the second week of storage, the sphere in cyclic surveillance exhibited slight porosity, allowing some air leakage through the walls. This sphere lost pressure at the rate of about 300 p.s.i. per week, but each week was recharged to 2000 p.s.i.

The comparison of volumetric expansion data taken before and after storage periods showed no significant change except in the case of the sphere stored at 160° F. This sphere, when tested at 3500 p.s.i. after storage, developed a gain in volume of 134 ml. as compared with 68 ml. at 3500 p.s.i. before storage. This represents almost a 100% increase over the initial gain. This item also showed a permanent set of 70 ml. or 52% when pressure was released. No visual defects were observed on exteriors of any sphere except for slight discolorations of the surface.

As a final evaluation of climatic effects, the spheres were brought to room temperature after storage and ruptured hydrostatically. The results were as follows:

Storage condition	*Pressure at burst*
a. After 160° F.	8700 p.s.i.
b. 113° F. and 85% R.H.	8700 p.s.i.
c. −65° F.	8500 p.s.i.
d. Alternate 165 and −65° F.	7500 p.s.i.

Obviously the limited number of samples available for the tests described precludes any definitive evaluation. General trends are indicated as regards effect of temperature on reinforced plastics spheres. Most significant are the altered elastic properties observed for the pressurized sphere stored at 160° F. The greatly increased elasticity reported is probably attributable to a thermoplastic tendency in the particular polyester resin formulation used for binding. Variations are possible, however, in binding resin formulation.



Fig. 5—Effects of .50-caliber bullet fired into a glass-reinforced plastics sphere pressurized to 2100 p.s.i.



Fig. 6—Effects of .50-caliber bullet fired into steel sphere that has been pressurized to 2000 p.s.i.

Gunfire Tests

Continuing the complete evaluation of reinforced plastic spheres for flame-thrower pressure vessels, tests were conducted of fragmentation properties. It is discussed here to illustrate aspects not generally necessary for consideration in industrial development, but of great concern to the military.

A study of fragmentation by small-caliber gunfire was made to determine the extent of shatter and splintering effects that would be produced by the impact of .50-caliber ball ammunition on a plastic sphere pressurized to 2100 p.s.i. For comparison purposes, a steel cylinder and steel sphere were pressurized to 2000 p.s.i. and subjected to the same gunfire fragmentation test. All the target vessels were placed approximately 50 yd. from a machine gun and one round of .50-caliber ball ammunition was fired into each.

The effect of the projectile on the plastic sphere was that it made an entrance hole only slightly larger than the bullet itself and an exit hole approximately 7 by 2 cm. (3 by ¾ in.). The bullet caused no fragmentation, producing only shredding of the glass fibers at the entrance and exit holes (Fig. 5).

The effects of the projectiles on the steel pressure vessels were such as to produce fragmentation. Fragments of the cylinder wall were found inside the vessel itself; hence it appeared that the bullet had caused fragmentation at both its entrance and exit holes. In the case of the steel sphere, while no fragments were found, it appears certain from the nature of the bullet holes that fragments were produced (Fig. 6).

Stress-Strain Analysis

The effect of internal pressure on stress-strain behavior of reinforced plastics was also given careful con-

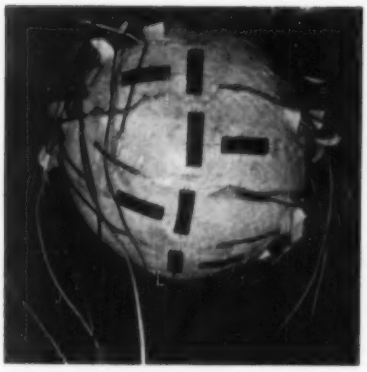


Fig. 7—Reinforced plastics sphere with SR-4 strain gages in place to determine stress-strain relationships

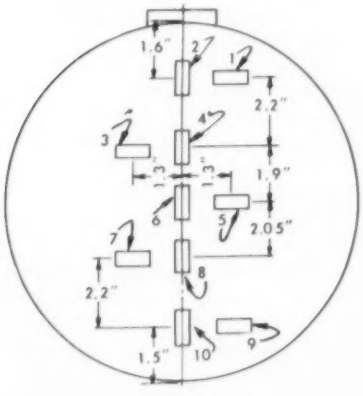


Fig. 8—Diagram of location and direction of 10 SR-4 strain gages used to determine stress-strain relations

sideration. Ten SR-4, type A-1, strain gages were affixed to various points about the surface of a plastic sphere, as shown in Figs. 7 and 8, and readings taken as internal pressure was increased. In order to compensate for temperature variations, a strain gage mounted to an unpressurized sphere was made another arm of the measuring circuit. Thus, any changes in size and shape of the active gage due to temperature were cancelled out by identical changes in the unstrained compensating gage. Reading of the several gages by a single indicator was made possible by introducing a bridge balancing unit into the circuit.

To obtain sufficient points for accurate graphing, internal pressure was applied to the sphere in increments of 400 p.s.i. and as each increment was added, the gage reading was recorded for each location. The resulting data were plotted as stress-strain graphs, shown in Figs. 9 and 10, p. 156. The sphere ruptured at a pressure of 7200 p.s.i.

An analysis of the stress-strain graphs (Fig. 9) shows that in the vicinity of 2000 p.s.i. stress there is a sharp change in slope, indicating a sudden increase in the strain rate over a pressure increment of approximately 500 p.s.i. This is followed by another sharp change in the reverse direction, tending to reorient the graph back to its former slope or strain rate. This phenomenon has been reported by others who have conducted similar stress-strain tests on plastic and glass-fiber covered pressure vessels. The theory is postulated that this sudden increase in strain and subsequent reorientation indicates stress redistribution through adjustment of the reinforcing glass fiber strands. Specifically, any irregularities existing in the plastic and glass fiber matrix after fabrication tend to orient themselves as the outer cover tends to assume a true spherical shape under pressure and any points of stress concentration become redistributed as plastic yield takes place. Further study of the graph indicates another such redistribution and readjustment at 4000 p.s.i. and finally failure at 7200 p.s.i. Thus, it appears the data may be interpreted as following the pattern of a geometric ratio 2, 4, 8 or 2, 2^2, 2^3.

In the further discussion of stress-strain analysis, the sphere will be referred to as having a top and bottom, with the top being the pressure connection. The strains can thus be designated vertical and horizontal according to their direction with respect to the top and bottom of the sphere. Figure 8 shows the pairing of strain gages on the periphery of the sphere, with gages 1, 3, 5, 7, and 9 recording horizontal strains and gages 2, 4, 6, 8, and 10 measuring vertical strains.

Figure 10 shows that the strains recorded at gage 5 are markedly less than those measured at similar stress values by the four other horizontal gages. This is explained by the presence of a heavy weld bead located in the aluminum liner under gage 5 and running parallel to it. The horizontal strain in the outer plastic cover would, therefore, be less at this point since the heavier section of liner would transmit less of the stress than the rest of the aluminum shell.

Analyzing the recordings made during progressive increases of internal stress, it is apparent that strains at the extreme top and bottom of the sphere were greater in the horizontal direction than vertical. In the middle of the sphere, and especially in the middle section of the top hemisphere, the strains were greatest in the vertical direction. This was, of course, predictable in these measurements as the reinforced plastics vessel tested was not truly spherical but actually an el-

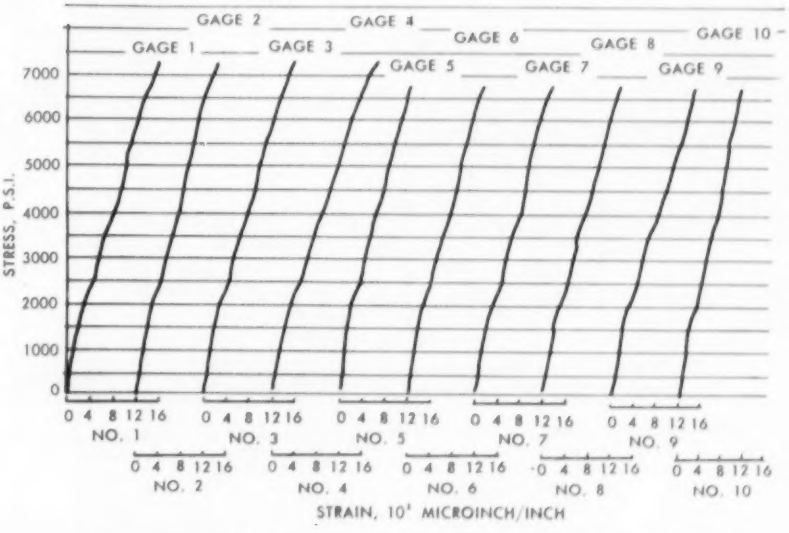


Fig. 9—Typical graph of stress-strain relationships for a fibrous glass-reinforced plastics spherical vessel, pressurized to 7200 p.s.i. in 400-p.s.i. increments

liptical spheroid in which the hoop tension in the horizontal plane would be less than the shell tension in the vertical plane of its middle section. It will be recalled that mention was made earlier in this report of fatigue failures encountered in the same area.

At rupture pressure the sphere developed a horizontal break in the vicinity of gage 3. Samples obtained from the vicinity of the rupture showed that the glass strands had a tensile strength greater than 125,000 p.s.i. while strands at other locations of the sphere showed tensile strengths only slightly more than 25,000 p.s.i. Uncoated strands used in construction of this sphere had previously been determined to have a tensile strength between 55,000 and 60,000 p.s.i.

In this, as in all the other cases of rupture of the spheres, the fracture line was never parallel to the direction of the glass roving. However, if the criss-cross configuration of the roving is considered, all fracture lines followed along the diagonals of the parallelograms formed by this winding. Since, as shown, the tensile strength of the glass strands is over 125,000 p.s.i. in these fracture areas it seems that the points of roving intersection are subjected to stresses other than tensile stress (hoop). These probably include shear stresses from bending due to tangential (or peripheral) strain and double shear stresses due to normal (or radial) strain. As glass fiber is considerably stronger in tension than in shear, the failure of the roving would occur at points of multiple stress in the intersections. This would account for the fracture pattern being along the diagonal of the parallelograms formed by the roving crossings.

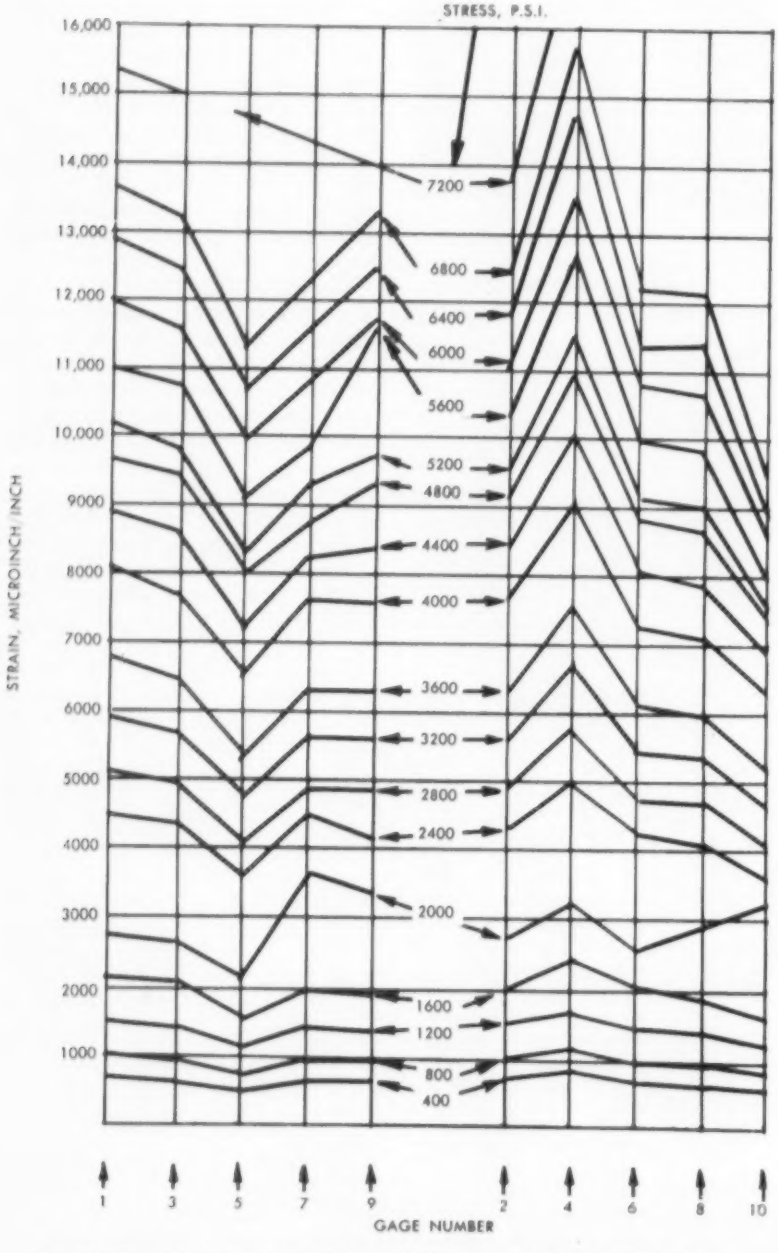


Fig. 10—Comparison of strains at points of plastics sphere subjected to identical stress

Cylindrical Vessels

As stated in the introductory portion of this report, development of cylindrical plastic pressure vessels is also receiving considerable attention by the Chemical Corps. While final evaluations have not been completed, certain preliminary data are available regarding performance of some cylindrical designs.

A commercial type fibrous glass-reinforced plastics cylinder was tested to compare its performance with spherical vessels of similar construction. In contrast to the spheres, a plastic liner of modified epoxy resin was utilized in the cylinder instead of an aluminum shell. While claimed to enable fatigue life of many thousand cycles, no factual data are available to determine whether the use of a plastic liner really offers such performance. When subjected to hydrostatic test of 3500 p.s.i., two of these cylinders developed a permanent set of 9.25% and 1.96% respectively. However, neither cylinder developed any leaks when retested at 2000 p.s.i. air pressure.

The evaluation was continued by placing one cylinder at an adjusted pressure of 2000 p.s.i. in high temperature storage of 160° F. After a 4-hr. period, the cylinder ruptured at a point 1 in. from the pressure connection end (Fig. 11, p. 236). As the ends were machined to obtain a smooth taper, this area had obviously been reduced to minimum strength. When the cylinder was examined after rupturing, the thermo-

(*To page* 236)

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General

REPORT ON THE GERMAN PLASTICS INDUSTRY. W. Kneip. Plastics (London) *20*, 138-39 (May 1955). Up to the end of the second World War, Germany was the largest producer of plastics, along with the United States, with a production of 250,000 tons in 1944. In 1947, however, Western Germany produced only 23,000 tons of plastics, less than 3% of the world production, whereas the United States produced 70% and Great Britain 13 percent. In 1953, Germany regained second position with a production of 240,000 tons, representing 11% of the world's output, compared to 9% for Great Britain and 63% for the United States. In 1954 German plastics production increased 35% to 325,000 tons, whereas the rate of growth of the German chemical industry was only 13% for that year.

Materials

MANY PARTS MADE FROM THERMOPLASTIC SHEET. J. B. Campbell. Materials & Methods *41*, 99-104 (Mar. 1955). Thermoplastic parts molded from sheet have replaced many parts formerly made of steel, aluminum, wood, rubber, glass, leather, cardboard, and fabric. Typical products include tote boxes, display signs, watch crystals, equipment housings, refrigerator door linings, carrying cases, and acid-resistant fume hoods. In some cases, they have replaced injection-molded thermoplastics; more often they are used where injection-molded plastics would be too expensive, such as for parts of large projected area, parts to be made in limited quantities, or parts having extremely thin sections. The current surge of interest in the forming of thermoplastic sheet is due to recent improvement in both materials and methods. Higher-impact materials, especially the modified styrenes and vinyls, have increased formability and design flexibility. Automatic, rapid-cycle vacuum forming machines have made sheet molding more suitable for long production runs. In sheet molding, flat thermoplastic sheet is preheated to temperatures in the range from 180 to 360° F., depending on the material, its thickness, and the severity of the forming required. The hot sheet is then formed by mechanical, air, or hydraulic pressure, which is maintained until the sheet has cooled below its heat distortion temperature. Unwanted flange is sawed or blanked from the molded part, rough edges are sanded down, and the part is then ready for whatever additional finishing or assembly operations are required. A description of the basic methods for forming thermoplastic sheet of various shapes is given, and a table lists the comparative properties and cost of thermoplastic sheet materials and their suitability for a large variety of specific applications.

NEW POLYMERIC DISPERSANTS FOR HYDROCARBON SYSTEMS. C. B. Biswell, W. E. Catlin, J. F. Froning, and G. B. Robbins. Ind. Eng. Chem. *47*, 1598-1601 (Aug. 1955). A new class of surface-active agents for hydrocarbon systems is described. The materials are oil-soluble copolymers containing basic nitrogen. Data are presented concerning the surface activity and the suspending and solubilizing action of these materials. The effect of changes in composition of the copolymers on their performance is discussed. These additives are effective in promoting engine cleanliness under low temperature conditions and in the stabilization of fuel oil.

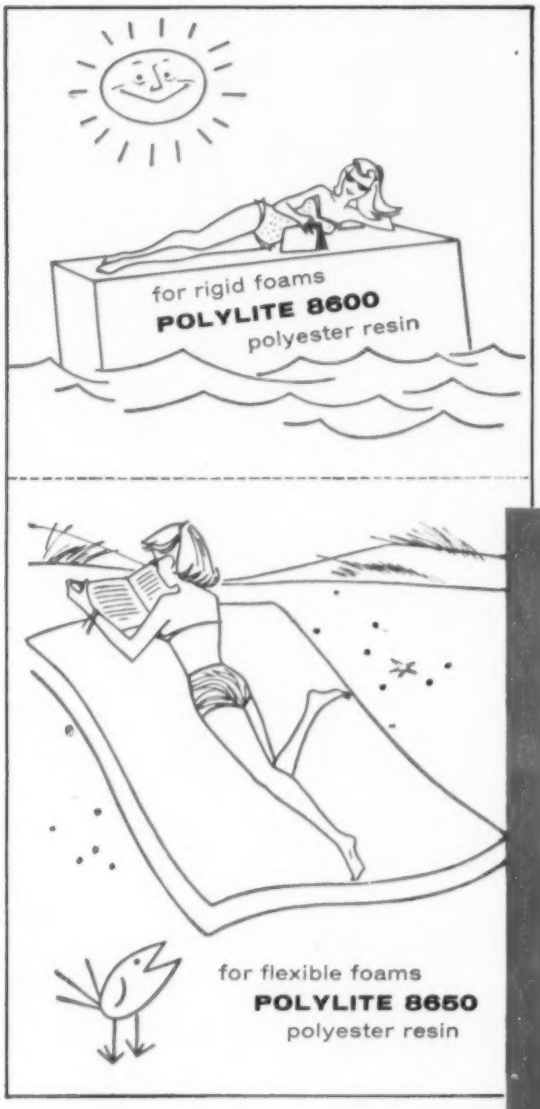
STYRENATION OF ALKYDS WITH CONTROLLED MALEIC FUNCTIONALITIES. L. Shechter and J. Wynstra. Ind. Eng. Chem. *47*, 1602-04 (Aug, 1955). Polyesters and oil-modified alkyds containing a small amount of α,β-unsaturated dibasic acid, such as maleic, along with a major proportion of a nonreactive dibasic acid, such as phthalic, can be copolymerized with vinyl monomer to yield soluble, homogeneous products. Several alkyd composition factors—maleic content, degree of esterification, type of polyalcohol, and extent of oil modification—which are interdependent on one another were combined in one parameter, maleic functionality, which was then used to define the operable alkyd composition range for copolymer formation under a given set of conditions. A mathematical formula to calculate this functionality was derived and found very useful in predicting whether a given polyester composition can be expected to yield a gelled or soluble, a heterogeneous or homogeneous product on styrenation.

Molding and Fabricating

EFFECTS OF MOLD TEMPERATURE ON THE BEHAVIOR OF THERMOPLASTICS. G. B. Thayer. SPE J. *11*, 22-24 (May 1955). Mold temperature exercises control, along with other control factors, over four aspects of injection molding: resistance to plastic flow, physical properties of the molding, surface finish, and length of the molding cycle. An increase in mold temperature in the lower range is usually beneficial in assisting the flow and in decreasing the pressure required to fill. As the temperature increases, however, a warmer mold becomes so much easier to fill, pressure control becomes difficult. If the mold is too warm, the molding will stick in the mold and if too cool, the piece may not fill completely. It is likely mold temperature exercises indirect effects, mainly, upon the physical properties of injection molded thermoplastics, by influencing such factors as effective pressure. Mold temperature affects the surface luster of nearly all thermoplastic materials, although some are little affected. Surface blisters or silver streaks sometimes are subject to control by means of mold temperature, as is surface "cottoning." The optimum mold temperature for shortest cycles may not be the lowest possible in all cases.

THE FUTURE OF VACUUM FORMING. Plastics (London) *20*, 136-37 (May 1955). Vacuum forming has become a well established industrial process in the past three years. Relatively

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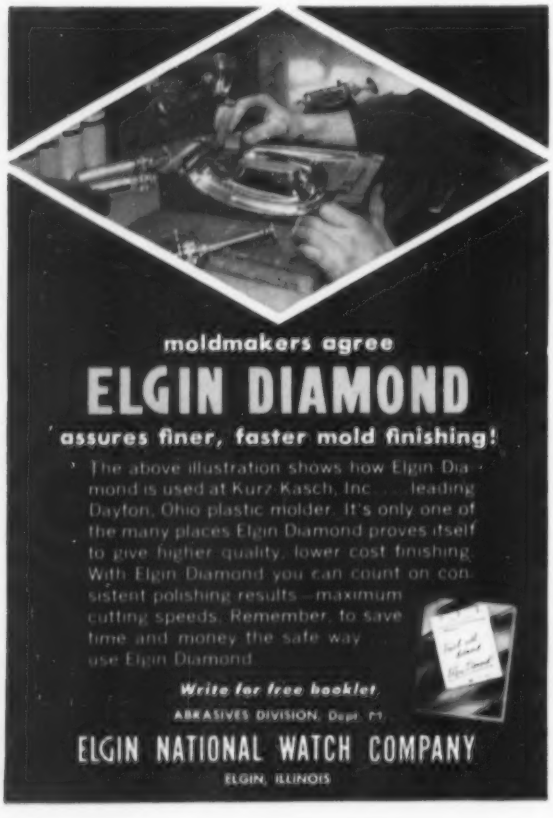
Applications

OPTIMISTIC OUTLOOK FOR PLASTIC VALVES. R. B. Seymour. Chem. Eng. *62*, 280, 282, 284, 286, 288, 290, 292 (June 1955). While various metals and metal alloys are completely suitable for some valve parts, there are many other places where no available material is as satisfactory as plastics for valve components. A wide variety of suitable plastic construction materials is now available for valve manufacture, including epoxies, furans, phenolics, polyesters, cellulose acetate butyrate, polyfluorocarbons, polyvinyl chloride, saran, and styrene rubber. The properties of each of these plastics are reviewed, and the construction of plastic valves is discussed.

Properties

1954 ACTIVITY OF THE COMMITTEE FOR PLASTICS (FNK) IN THE GERMAN COMMITTEE FOR SPECIFICATIONS (DNA). G. Höchtlen and G. Ehlers. Kunststoffe 45, 187-93 (May 1955). The activity of the German Committee for Plastics since 1953 is reported. A list of the new standards which have been established and of tentative standards is included.

VARIATION WITH TEMPERATURE OF THE ELECTRIC STRENGTH OF POLYISOBUTYLENE SUBJECTED TO DISCHARGES. E. M. Hawley. Electrical Research Assoc. Technical Report L/T290, 1953. The variation with temperature of the corona electric strength of polyisobutylene shows no marked correlation with the variation of its intrinsic electric strength over the same temperature range. This does not necessarily imply that the mechanism of corona breakdown is unrelated to that of intrinsic breakdown, but that other factors must be of greater significance; e.g., the local temperature rise, at the dielectric surface, caused by discharges may greatly exceed the ambient temperature, so that the high temperature intrinsic electric strength determines the breakdown voltage, independently of the temperature of the sample as a whole. The average corona electric strength of films of polyisobutylene of between 50 to 80 microns thickness is about 25% above the average for films of between 120 and 180 microns thickness, but this is only just significant because the scatter in values is of the same order. The short-time corona electric strength, when breakdown occurs within 1 min. of commencing a test, is approximately twice the long-time corona electric strength when breakdown occurs after several hours test. In about 30% of the long-time tests, breakdown occurs at the instant of increasing the applied voltage or within 1 min. of an in-





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CADMIUM 2-V-400: Modified 2-V-4.
CADMIUM 2-V-8: Selected laurate, used principally with low fusing resins.
BA-CD 12-V-5: Coprecipitated laurate.
CADMIUM 22-V-1: For rigid, clear and opaque stocks.
ORGANIC 7-V-1: Epoxy assistant.
ORGANIC 7-V-4: Epoxy assistant, for rigids.
BARIUM 1-V-3: Dispersible stearate, to contribute lubricity with barium effects.
BARIUM 1-V-6: For asbestos filled tile.
BARIUM 1-V-7: Liquid, for modified plastisols and organosols.
CALCIUM 5-V-1: Dispersible stearate, to contribute with calcium effects.
CALCIUM 5-V-22: Dispersible, low melting stearate to reduce internal friction.
ORGANIC 8-V-100: Modified 8-V-1.

crease. This may indicate that, in the absence of chemical deterioration, there must be a critical stress in the dielectric before breakdown can occur, irrespective of the duration of previous exposure to corona. The length of the air gap in series with the dielectric film at the breakdown sites shows a relatively large dispersion but tends to confirm Thomas' observation that there is a finite spacing of the air gap in series with the dielectric film which gives a minimum breakdown voltage.

Testing

STRESS RELAXATION OF NON-METALLIC GASKET MATERIALS. D. R. Lem and J. M. Reynar. ASTM Bull. No. 207, 81-85 (July 1955). The Farnam-Cole Relaxometer is not the ultimate in instruments for testing gasket materials. The hydraulic system tends to leak; the gages are whimsical; extreme care in reading gages accurately, exact timing, and precise manipulations are required. The Farnam-Cole Relaxometer, Type RT, Model D, is currently adequate for qualification testing of all varieties of non-metallic gasket materials. A testing procedure and a formula are presented for accurately determining a very important property of gasket materials—percentage stress relaxation. Curves are presented that show stress relaxation as it has been determined for all types of commercial gasket materials from very soft cork products to very hard compressed asbestos sheet.

Chemistry

INTERACTION OF β-PARTICLES WITH ORGANIC LIQUIDS IN THE PRESENCE OF VINYL MONOMERS. W. H. Seitzer and A. V. Tobolsky. J. Am. Chem. Soc. 77, 2687-92 (May 20, 1955). Solutions of common organic liquids with vinyl monomers (either styrene or methyl methacrylate) were exposed to a point source of β-particles, and the resulting rates of polymerization were measured for several monomer concentrations. An expression was derived which relates rate of chain initiation to the measured rate of polymerization in terms of the average absorption coefficient for the β-particles. The number of radical chain starters produced in the various organic liquids per 100 electron-volts of energy absorbed was thereby calculated. The halogen-containing solvents were the most sensitive to β-radiation among those tested. Fewer halogen atoms per molecule gave less sensitivity. Iodine atoms were more sensitive than bromine atoms. Hydrocarbons were the least efficient, the aromatics being less efficient than the aliphatics. Other functional groups, such as esters and ethers, had about the same level of efficiency as were found to exist with single halogen atoms.

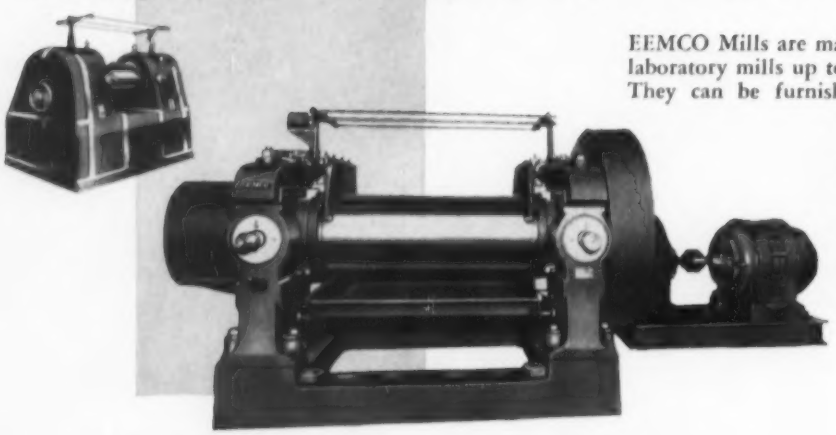
Publishers' Addresses

ASTM Bulletins: American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.
Chemical Engineering: McGraw-Hill Digest Publishing Co., Inc., 330 W. 42nd St., New York 18, N. Y.
Electrical Research Associates: The British Electrical and Allied Industries Research Association, Thorncroft Manor, Dorking Rd., Leatherhead, Surrey, England.
Industrial and Engineering Chemistry: American Chemical Society, 1115 Sixteenth St., N. W. Washington, D. C.
Journal of the American Chemical Society: American Chemical Society, 1115 Sixteenth St., N. W. Washington, D. C.
Kunststoffe: Karl Hanser Verlag, Leonhard-Eck-Strasse 7, Munich 27, Germany.
Materials and Methods: Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.
Plastics (London): Temple Press Ltd., Bowling Greene Lane, London E. C. 1, England.
SPE Journal: Society of Plastics Engineers, Inc., 513 Security Bank Bldg., Athens, Ohio.

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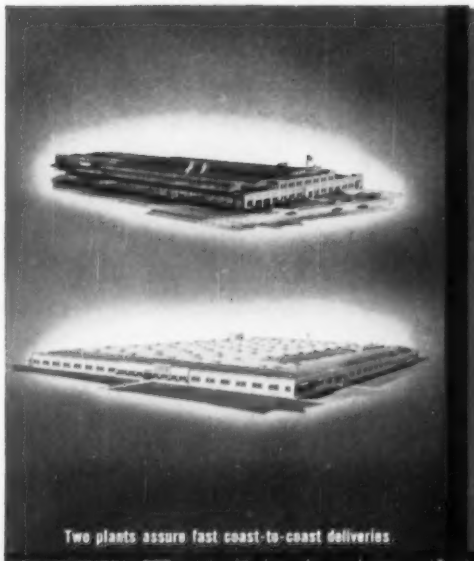
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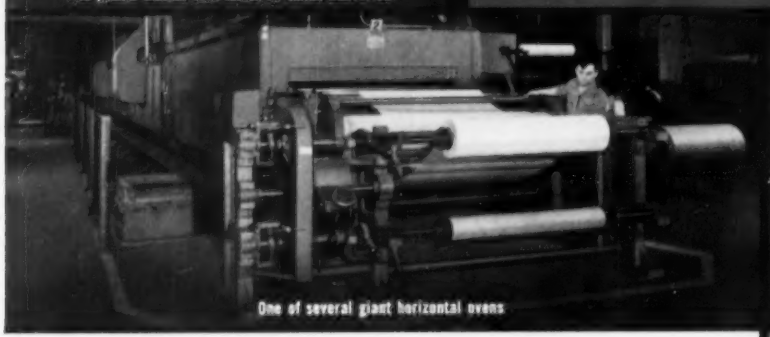
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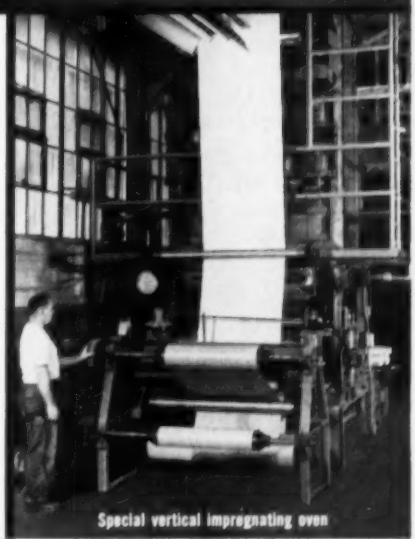
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U. S. PLASTICS PATENTS

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VINYL SILANES. A. F. Gordon (to Dow Corning). U. S. 2,715,113, Aug. 9. Reaction of vinyl silanes with perhaloalkanes.

RESINS. R. M. Huck (to Monsanto). U. S. 2,715,114, August 9. Phenolic resins.

POLYMERIZATIONS. J. M. Grim (to Koppers). U. S. 2,715,118, Aug. 9. Suspension polymerization.

POLYETHYLENE. K. S. Hoover (to A. B. Dick). U. S. 2,715,363, Aug. 16. Printing on polyethylene.

ARTIFICIAL LEATHER. J. D. Armitage, C. Bliss, and D. Ezell (to J. L. Armitage). U. S. 2,715,587, Aug. 16. Resinous film.

ARTIFICIAL LEATHER. B. Graham and J. A. Piccard (to Du Pont) U. S. 2,715,588, Aug. 16. Films of linear condensation polymers.

STATIC CONTROL. H. P. Lundgren, C. H. Binkley, and A. S. Yeiser (to U. S.). U. S. 2,715,592, Aug. 16. Polymeric beta-propiolactone.

SHEET MATERIAL. D. M. Hawley (to Hawley Products). U. S. 2,715,596, Aug. 16. Resinous sheet with rigid sections attached.

HEAT-SEALED ARTICLES. L. C. Hosfield (to Carbide and Carbon). U. S. 2,715,597, Aug. 16. Making ruffled heat-sealed articles.

ADHESIVELY BONDED SURFACES. J. Rees and H. J. Pollard (to Bristol Aeroplane). U. S. 2,715,598, Aug. 16. Joining surfaces with heat-hardening resins.

PLASTICS. J. M. DeBell and M. H. Nickerson (to Orangeburg Manufacturing). U. S. 2,715,615, Aug. 16. Vinyl chloride plasticized with coal tar pitch.

POLYTETRAFLUOROETHYLENE. H. S. White (to U. S.). U. S. 2,715,617, Aug. 16. Bearing of compressed powdered metal and polytetrafluoroethylene.

MELAMINE RESINS. T. J. Suen (to American Cyanamid). U. S. 2,715,619, Aug. 16. Alkylated methylol melamines.

POLYMERS. E. F. Carlson and F. G. Lum (to California Research). U. S. 2,715,620. Aug. 16. Superpolyamides of 5-*t*-butyl-isophthalic acid.

HOLLOW ARTICLES. W. C. Weber (to Owens-Illinois). U. S. 2,715,751, Aug. 23, 1955. Forming hollow articles.

ROLLER. H. W. Sawyer (to Wallace and Tiernan). U. S. 2,715,879, Aug. 23. Roller surfaced with trifluorochloroethylene polymer.

HEAT SEALING. R. N. Sabee and W. L. Wogstand. U. S. 2,715,934, Aug. 23. Heat-sealing apparatus.

CELLULOSE ESTERS. L. W. A. Meyer and M. H. Broyles (to Eastman Kodak) U. S. 2,716,071, Aug. 23. Light stabilized cellulose esters.

METHYLCELLULOSE. W. J. Hanson (to Dow). U. S. 2,716,072, Aug. 23. Methylcellulose powder.

PAPER COATING. W. F. Mick and O. B. Amley (to Dow). U. S. 2,716,074, Aug. 23. Coating paper with Saran.

COATING. R. A. Wiese (to U. S.). U. S. 2,716,075, Aug. 23. Coating surfaces with polyethylene.

RESINS. W. E. Leistner and A. C. Hecker. U. S. 2,716,092, Aug. 23. Vinyl chloride stabilized with a phenolate.

SOLUTION. W. R. McClellan (to Du Pont). U. S. 2,716,093, Aug. 23. Solutions of polyacrylonitrile.

POLYELECTROLYTES. H. L. Morrill (to Monsanto). U. S. 2,716,094, Aug. 23. Free flowing solid particulate polyelectrolytes.

ACRYLONITRILE. G. W. Stanton and F. A. Ehlers (to Dow). U. S. 2,716,095, Aug. 23. Acrylonitrile polymers stabilized with formals.

POLYMERS. C. C. Unruh and C. F. H. Allen (to Eastman Kodak). U. S. 2,716,097, Aug. 23. Polymers of vinyl substituted benzal acetophenones.

RESINS. T. F. Bradley and H. A. Newey (to Shell). U. S. 2,716,099, Aug. 23. Condensates of alkyl phenol novolacs with epichlorohydrin.

POLYMERS. H. W. Coover, Jr. and M. A. McCall (to Eastman Kodak). U. S. 2,716,100-1, Aug. 23. Linear polymeric organo-phosphonates.

POLYMERS. C. C. Unruh and C. F. H. Allen (to Eastman Kodak). U. S. 2,716,102-3, Aug. 23. Vinylcinnamalacetophenone polymers and vinylbenzalacetophenone polymers.

INTERPOLYMERS. H. Gilbert and F. F. Miller (to B. F. Goodrich) U. S. 2,716,104-5-6, Aug. 23. Interpolymers of vinylidene cyanide.

COPOLYMERS. H. W. Coover, Jr. (to Eastman Kodak). U. S. 2,716,108, Aug. 23. Copolymers of acrylonitrile and alpha-chloroacetamidoacrylic acid.

POLYMERS. R. P. Ruh and M. R. Rector (to Dow). U. S. 2,716,109, Aug. 23. Polymeric 1-chloro-1, 2-difluoroethylene.

POLYMERIZATION. D. C. Seymour (to U. S. Rubber). U. S. 2,716,110-1-2, Aug. 23. Polymerization of vinyl chloride with N-chlorophthalamide or a benzenesulfonyl chloride.

WATER SKI. J. R. Billingham. U. S. 2,716,246, Aug. 30. Water ski containing polystyrene foam.

BONDING. L. Marks (to Polymer Industries). U.S. 2,716,612, Aug. 30. Adhering to silicone-treated surfaces.

ADHESIVE. W. Schoen (to Masonite). U. S. 2,716,613, Aug. 30. Ammoniated hydrolyzed lignin.

FILM. R. S. Voris (to Hercules). U. S. 2,716,615, Aug. 30. Carboxymethylcellulose film.

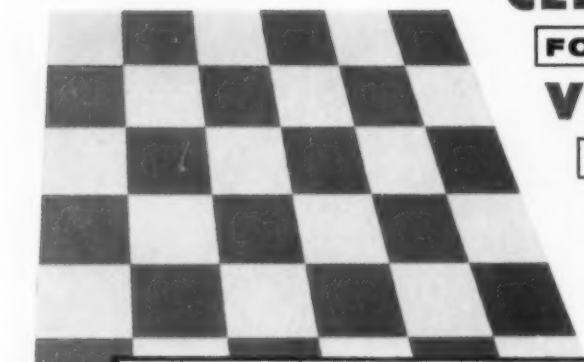
POLYMERIZATION. V. A. Englehardt and M. L. Peterson (to Du Pont). U. S. 2,716,633, Aug. 30. Photopolymerizable compounds.

ARTIFICIAL SNOW. A. L. Bunting (to Continental Filling). U. S. 2,716,637, Aug. 30. Artificial plastic snow.

POLYMER. M. Cohen and J. R. Ladd (to General Electric). U. S. 2,716,638, Aug. 30. Divinyltetramethyldisiloxane polymers.

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LINDOL* tricresyl phosphate coal tar base	99% Technical	Clear transparent liquid	50	1.167 ± 0.005	0.1	30	0.1
CELLUFLEX* CEF tris beta chlorethyl phosphate	99% Technical	Clear transparent liquid	50	1.425 ± 0.005	0.1	—	0.1
CELLUFLEX* TPP triphenyl phosphate	99% Technical	White flakes	20 (2)	1.221 (1)	0.03	30	0.1
CELLUFLEX* DBP dibutyl phosphate	99% Technical	Clear transparent liquid	25	1.045 ± 0.001	0.1	—	0.1
CELLUFLEX* DOP dioctyl phosphate	99% Technical	Clear transparent liquid	25	0.985 ± 0.004	0.1	—	0.1
CELLUFLEX* 179A tricresyl phosphate ortho content less than 1%	99% Technical	Clear transparent liquid	100	1.143 ± 0.006	0.1	30	0.1
CELLUFLEX* 179EG** tricresyl phosphate, electrical grade	99% Technical	Clear transparent liquid	100	1.143 ± 0.008	0.1	30	0.1
CELLUFLEX* 112 a mixed ester	99% Technical	Clear transparent liquid	40	1.200 ± 0.005	0.1	30	0.1

(1) @ 60° C.. (2) Molten **Volume Resistivity: 16 megohm /cm x 10^7 @ 23° C. min.

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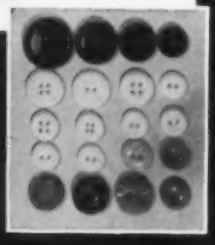
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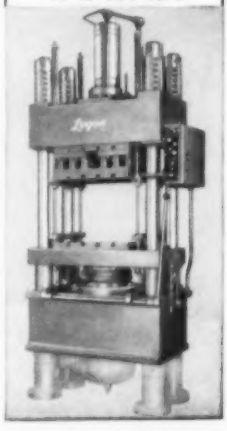
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ICI
OP.14

NEW MACHINERY AND EQUIPMENT

Material Hoist—Electrically operated, vacuum-type, automatic self-contained hopper loader consists of a vacuum tank approximately 15 in. in diameter and 24 in. high which is clamped to the side of a hopper or bin and automatically loads about 15 lb. of styrene every 30 seconds. The unit requires no floor space.

Material is conveyed from drum to hopper by way of a suction tube, one end of which goes into the loader and the other of which is simply inserted into the material drum. The manufacturer claims that this unit overcomes problems of compressed air cost, moisture, floor space requirements, and low carrying capacity found with conventional-type loaders.

The loader is not recommended for dry-colored material but is claimed to handle virtually all other types of virgin or reground plastics. It is designed for 115-v. 60-cycle, single-phase installation. A magnetic attachment which automatically removes tramp iron from plastics materials passing through the loader is available at extra cost. *Injection Molders Supply Co., 3514 Lee Rd., Cleveland, Ohio.*

Heat Sealer—Model 300-SB25 3-kw. electronic heat sealer has an output oscillator tube rated at 4-kw. capacity. Thus, with the sealer operating at maximum load, only 75% of the tube's capacity is drawn, resulting in less strain on tube and component parts. According to the manufacturer, the tube will give up to six years' trouble-free performance. The sealing machine has a standard bed plate of 18 by 24 in., fully adjustable vertical stroke control, and slow-start mechanism circuitry. Built into the generator cabinet is an arc guard that requires no tuning when changing dies.

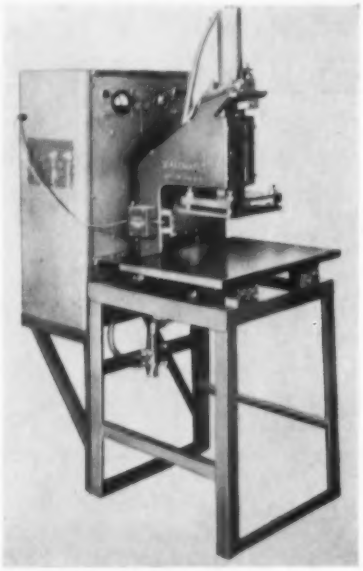
The press is actuated by push-buttons. In order to operate them, both hands of the operator have to be removed from press bed. An additional safety feature is an instantaneous emergency stop controlled from either side of the machine. *Sealomatic Electronics Corp., 429 Kent Ave., Brooklyn, N. Y.*

Turret Winder—Designated the Hobbs-Alquist Three-Shaft Turret Winder, this machine is designed to take a web from a previous continuous process and wind it continuously under controlled tension to rolls of predetermined diameter (up to 36 inches). The winder has three arbors, all of which can be clutched to the same controlled-tension drive. There is an arbor for the winding position, doffing position, and reserve position. As the predetermined buildup on the winding arbor is reached, the cycle commences and the winding arbor automatically moves to the doffing position, while the other arbors move to the reserve position and the winding position. *Hobbs Mfg. Co., 313 Salisbury St., Worcester, Mass.*

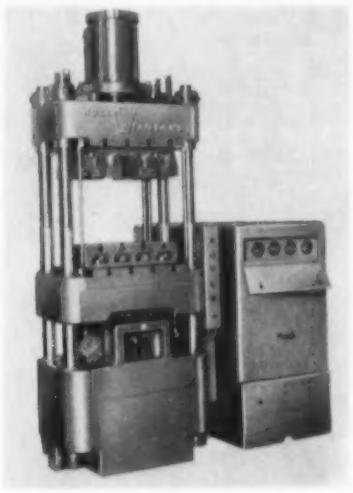
Molding Presses—The B series of a line of compression and transfer molding presses is said to have maximum closing and opening speeds of less than 3 sec., half that of former models. A sequence-type cycle controller is claimed to assure optimum molding conditions. Four vernier dials, calibrated in minutes and seconds, independently control closing, gassing, curing, and opening. Each operation is individually dialed, without need of manual compensa-



Injection Molders Supply's material hoist automatically loads approximately 15 lb. of styrene every 30 seconds



Sealomatic's 3-kw. heat sealer has an oscillator tube rated at 4 kw. for strain-free maximum-load operation



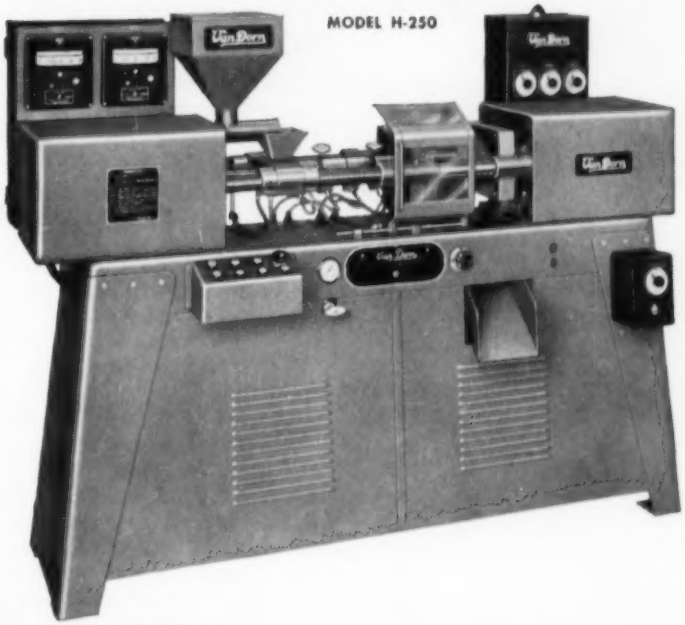
Hull-Standard's series B compression-transfer presses have maximum closing and opening speeds of 3 seconds

Profitable Plastics Production with...

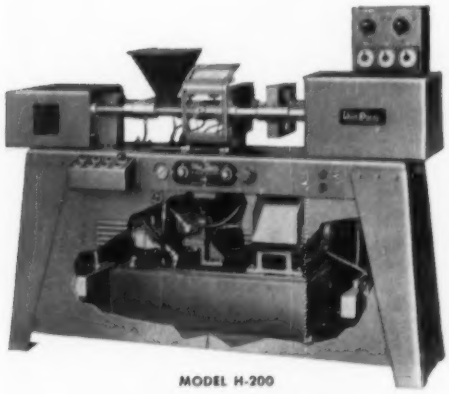
VAN DORN EQUIPMENT

AUTOMATIC OPERATION AT LOW COST

This high speed 2½ oz. injection press plasticizes material at 22 lbs. plus per hour, and attains up to 720 cycles per hour (dry run). High efficiency due to *water cooled* plunger, transfer hopper, and oil cooler. Accessible platen clamp device insures easy purging to change material. For safety, press will not operate unless part is fully ejected. Simple operation due to automatic, adjustable material metering device. Press requires little attention during production. May also be operated semi-automatically. All steel construction.



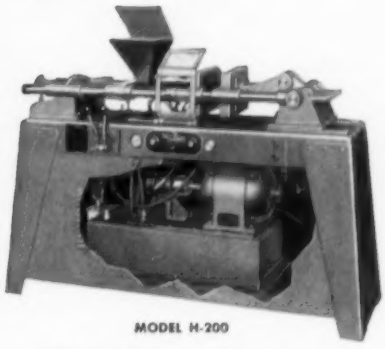
MODEL H-250



MODEL H-200

SEMI-AUTOMATIC 2 OZ. PRESS

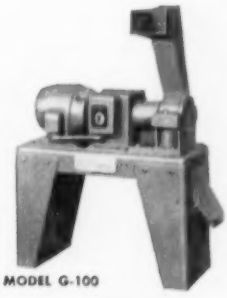
Up to 10 cycles per minute. Safe, simple push button controls. Accurate temperature regulation. Rugged, compact, quiet.



MODEL H-200

POWER OPERATED, LEVER CONTROLLED PRESSES

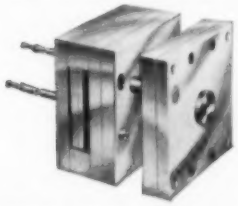
2 oz. or 1 oz. Operate 8 hours for under a dollar and use inexpensive molds. Easily set up in twenty minutes.



MODEL G-100

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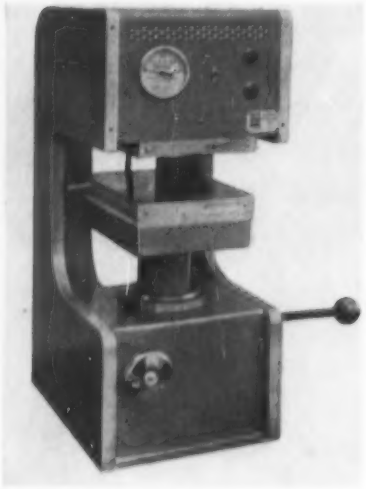
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tion of the other operations in the timing cycle.

The presses, of the toggle type and hydraulically actuated, are available in 50-, 150-, 200-, and 300-ton sizes. *Hull-Standard Corp., Abington, Pa.*

Hydraulic Press—A group of C-frame presses has been added to a line of standard straight-sided hydraulic presses. Platens have cast-in cooling coils. Calrod heaters are individually controlled by thermo-



Pasadena Hydraulics' C-frame presses incorporate two-stage hydraulic pump for maximum pressure and quick closing

switches to 600° F. A two-stage hydraulic pump is claimed to provide quick closing and to produce maximum pressure with ease. *Pasadena Hydraulics, Inc., 279 N. Hill Ave., Pasadena 4, Calif.*

Printing Press—Automatic press for silk-screen process and printing on a wide variety of sheet materials and flat objects, designated General Decorator Press, Series B, accommodates flexible sheet, bowed stock, and other materials that are difficult to handle on standard presses. It is said to be particularly adaptable to the production of printed circuits.

The press incorporates three basic elements: a reciprocating one-piece bed which supports and carries the work; a reciprocating stencil frame; and a stationary squeegee. The work is hand-registered to fixed guides fastened to the press bed. During the printing stroke, the work is held flat and in position by vacuum holes in the bed.

The press lays down a heavy deposit of color, including metallic inks. Split fountain printing is possible. The machine operates either at a constant cycle or at an adjustable intermittent cycle. In the standard model, one operator feeds and removes the sheets from the front of the press. A rear delivery, permitting straight line operation from feeding through printing to drying is optionally available.

Series B is built in three sizes, with maximum sheet dimensions ranging from 13 by 25 to 19 by 37 inches. Series A is an equivalent machine for use with rigid sheet material. *General Research & Supply Co., 572 S. Division Ave., Grand Rapids 3, Mich.*

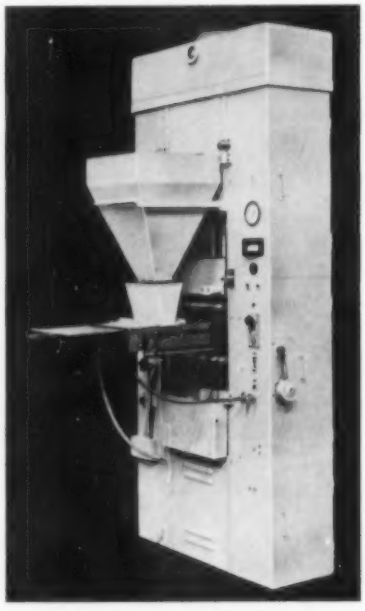
Hopper-Dryer-Loader—Improved hopper and temperature controls have been incorporated in the Model D & W Hopper-Dryer and loader combination. Designed especially for use with large extrusion machines, this extruder accessory comprises a heating and blower unit, a bin for loading material near floor level, and a large hopper to which the material is conveyed and where it is dried and heated. From the large hopper, the material is then conveyed to the hopper atop the extrusion machine. The unit uses no compressed air. The material is conveyed by means of heated air, which is also used for the drying process.

Operation is as follows: Air enters the heater-blower cabinet through a filter which removes dust and other foreign matter, and is heated as it passes over thermostatically controlled heating elements. A blower then forces the heated air through a flexible hose into the large hopper. A spreader at the end of hose discharges the air into the bottom of the large hopper at approximately 175° F. After the material has been thoroughly dried and preconditioned, it is conveyed from the large hopper to the machine hopper. *Thoreson-McCosh, Inc., 18208 W. McNichols Rd., Detroit 19, Mich.*

Compression-Transfer Presses—Available in three models, each offering a selection of three pressures, this line of compression-transfer molding presses is produced for manual or automatic operation. The presses were originally designed to work in groups of up to twelve, driven by a single oil-hydraulic drive unit. However, the machines can also be supplied as self-contained units. The manufacturer recommends the installation of a drive unit if the ultimate plan is to install two or more presses. Drive units are usually constructed to suit customer's requirements.

The hydraulic system used in these machines generates a medium pressure with a simple vane pump and feeds the presses through a ring main at 100 p.s.i. The pressure is then stepped up to either 2000 or 3000 p.s.i. by means of an intensifier built into the press. This arrangement makes possible a choice of three molding pressures for each machine. In the self-contained models, the hydraulic circuit is similar, except that the complete drive is built within the channel section of the press frame.

The automatic controls with which the presses are equipped can repro-



B.I.P.'s compression-transfer presses for manual and automatic operation each offer a choice of three pressures

duce, in conjunction with a slow-close valve, any thermosetting molding cycle phase, including dwell and breathing. Once the cycle is set and locked by a supervisor, neither the molding sequence nor the timing of

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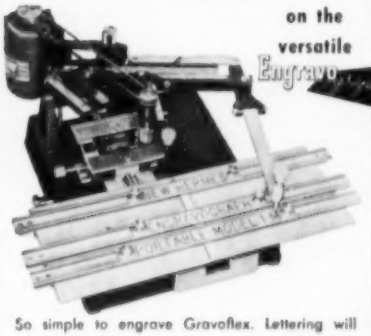
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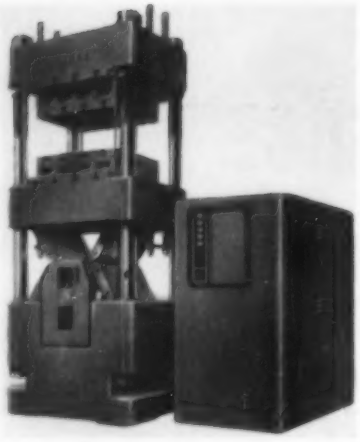
the molding operations can be changed by the operator.

Safety guards are pneumatically operated in the case of the type 100 and 200 machines. They are all interlocked with the chocking system and main control valve. A safety stop button is included on every press.

The electrical circuit is for 400/440-v., 3-phase, 4-wire, 50-cycles, a.-c. supply. The control panel built into the channel section is complete with switch contactor and fuse gear to split up the incoming three-phase supply into three separate single-phase heat zones for mold and platen heating. Each zone is thermostatically controlled by electronic controllers and the temperature can be read on a dial indicator.

The machines require a shop line pressure of 60 to 80 p.s.i. Water cooling is provided.

Type 40 has a pressure range of 20, 40, and 60 tons; table area of 15 by 15 in.; maximum daylight of 28 in.; and a 14-in. stroke. Type 100 has a pressure range of 50, 100, and 150 tons; table area of 22½ by 21 in.; maximum daylight of 38 in.; and an 18-in. stroke. Type 200 has pressure range of 100, 200, and 300 tons; table area of 30 by 33 in.; maximum daylight of 45 in.; and a 24-in. stroke. *B. I. P. Engineering Ltd., Streetly Works, Sutton Coldfield, England. American representative Ralph B. Symons Associates, Inc., 3571 Main Rd., Tiverton, R. I.*



Stokes' 50-ton semi-automatic compression and transfer press is designed for molding shallow parts

Compression - Transfer Press — Model 731, toggle type, 50-ton semi-automatic compression and transfer press is recommended by the manufacturer as especially suitable for molding shallow parts like resistors, capacitors, and similar items requiring insert work.

Control of set-up and cycle timing is provided by a bar controller which permits adjustments to be made by means of positioning buttons located on graduated bars. These buttons can be reset to meet new requirements when molds are changed. Their location can be adjusted even while the press is in operation.

Closing time is reported to be reduced by a three-stage automatically controlled closing action. A regenerative oil circuit is said to give high speed during initial ram approach. Oil taken out of the top of the ram is fed back into the bottom, thus giving about double the normal approach speed. This approach speed is then cut to about 25% at a predetermined (and adjustable) point; the intermediate speed is further reduced to a final closing speed as mold pressure builds up. This automatic slow-down, coupled with toggle action, provides approach and pressing speeds considered ideal by the manufacturer.

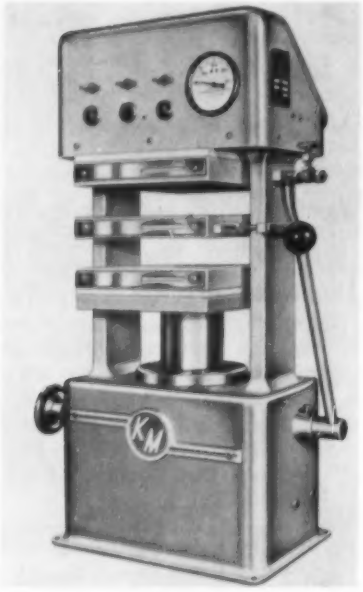
Mold closes only as fast as the material plasticizes, producing parts of high density. Return stroke is cushioned. *F. J. Stokes Machine Co., Inc., 5500 Tabor Rd., Philadelphia, Pa.*

Hydraulic Press—Model KM-2 multi-platen press for laboratory use, testing, laminating, and molding has a two-stage hydraulic pump which automatically switches from low to high pressure. The upstroke on the hydraulic control lever is used for low-pressure work to raise the ram rapidly; the downstroke is used for high-pressure work. The press develops up to 40,000 lb. on the platens. Individual thermoswitches permit temperature control up to 600° F. in each of the platens by means of cast-in electric heaters. Cast-in steel coils can be used for water cooling or oil, steam, or air heating.

The control panel of the equipment is at the top of the press, isolated and cooled by air space between the housing and upper platen.

Horizontal clearance between frames is 10¾ inches.

The KM-2 is available in 2-, 3-, and 4-platen models in both 8- by 8- and 9- by 12-in. sizes. A special model is available with electric pump, push button or single lever control, and automatic timing and pressure regulator. *Kingsbacher-Murphy Co., 6245 Lexington Ave., Hollywood 38, Calif.*



Kingsbacher-Murphy's hydraulic press is a multi-platen unit for laboratory use, testing, laminating, and molding

Die-Sinking Machine — Complicated and irregular shapes of dies, molds, metal patterns, templets, and cams can be produced from master patterns with Model FK-08 die-sinking machine, which has a system of automatic electrical controls. Time delays between impulses of tracer and engagement and disengagement of the cross slide table or spindle head are practically zero for engagement and 0.005 sec. for disengagement. Accuracy claimed for the unit is ±0.001 inch.

Three types of Model FK-08 are available: FK-08a is for profiling work or reproduction of impressions and reliefs by parallel strokes or passes of the automatic electric tracer and cutter; FK-08b is for the same work as FK-08a but can cut mirror-image impressions of the master model; FK-08c handles the same work as the above two models

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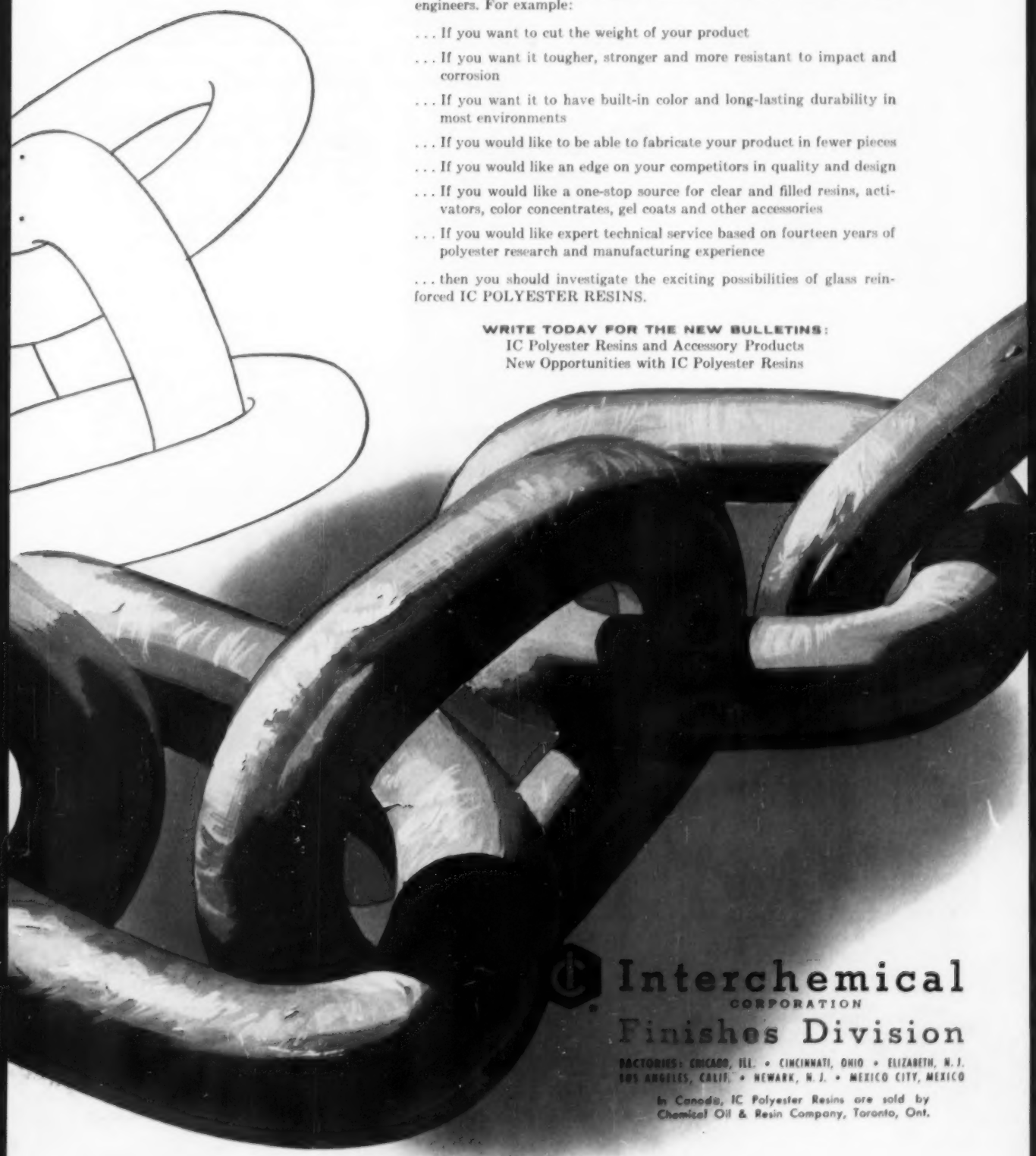
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but is equipped with two rotary tables for circular milling. *Staroba Industrial Research Co., Ltd., 299 Adelaide St. W., Toronto 2B, Ontario.*

Trimmer-Piercer — Line of hydraulic presses for trimming and piercing vacuum formed parts is claimed to produce operating speeds to match those of the forming equipment. The machine has fast ram approach and return of movable platen



Dake's hydraulic press trims and pierces vacuum formed parts at speeds matching those of the forming equipment

as well as adjustable stroke control for automatic slow-down before work is contacted.

Five models are available, ranging in capacity from 75 to 300 tons, platens from 40 by 50 to 60 by 80 in., and daylight from 22 to 44 inches. *Dake Corp., Grand Haven, Mich.*

Rotational Molding Equipment—Designated Roto-Molder, this machine for the rotational molding of vinyl plastisols rotates molds up to 19 in. in over-all height at speeds of 8 to 20 r.p.m. at the main shaft and 2 to 10 r.p.m. on the planetary drive. The molding machine uses two gang plates of molds at all times. In operation, each plate has several molds attached to it, the exact number depending on size of the molds. Cycle time varies with size of mold, thickness of sidewall, fusing temperature, operating temperature, etc., and falls in the general range of 5 to 8 min. per complete cycle.

The machine measures 75 in. high by 65 in. wide by 40 in. deep. A vertical door at the front of the equipment extends 28 in. above the machine when in the open position, making over-all height of the unit 103 inches. *Mercury Industries, Inc., Hillsdale, N. J.*

Tablet Machine—Model 533 is a 10-ton, high-speed rotary tabletting machine rated at up to 2500 tablets per min. that finds use in a variety of industrial compacting operations, including plastics preforming.

The press is made in two versions: one, with 33 stations, produces tablets up to 1 1/16-in. maximum diameter and 1 1/8-in. depth of fill at rates from 900 to 2500/min.; the other, with 27 stations, produces tablets up to 1 3/16-in. maximum diameter and 1 3/8-in. depth of fill at rates from 700 to 2000/minute.

Hydraulic loading of the upper pressure roll replaces ratchet spring loading used on older types of presses and is said to make possible more precise adjustment of pressure exerted by the machine. "Non-drop" inserts in the lower pressure rolls are claimed to prevent double impressions on embossed tablets. These inserts prevent the punch from jumping off the tablet until the moment of ejection. "Anti-jump" retainers on the lower cams are said to prevent damage to the punch or die when the machine runs low on powder.

According to the manufacturer, a



Stokes' tablet press uses hydraulic loading of upper pressure roll, has non-drop inserts in lower pressure rolls

large-diameter punch circle and wide roll faces reduce the load on bearing surfaces and punches and provide a safety margin for high-speed operations as well as overload protection. The press has a roll pressure of 36,000 lb./in. of displacement, claimed to be lower than that found in any other rotary tabletting machine.

Neckless punches are standard equipment. All controls are grouped at the front of the press. Also mounted on the control panel are pressure indicators, graduated in tons, and dial-type tachometers that indicate production in tablets per minute. Feed frames for both fill stations can be seen from the control position. *F. J. Stokes Machine Co., Inc., 5500 Tabor Rd., Philadelphia 20, Pa.*

Finishing Tool—Designed for edging and finishing molded thermoplastics and reinforced plastics pieces, diamond-coated steel "edge planers" are one-piece tools turned out on a lathe with any angle or radius grooves cut into the side or face. In operation, the edging tool is run on a high-speed drill press or routing head and the edge of the work to be finished is pushed across the perimeter of the planer to smooth the edge or cut the desired angle or radius.

According to the manufacturer, this tool eliminates the hand-filing operations formerly frequently required for finishing work, and makes it possible to edge thermosetting plastics in one pass, at high speeds, without coolants. Multi-groove edge planers permit forming square, radius, or angular edges without changing tools or station. *Dia-Chrome Co., 722 S. Verdugo Rd., Glendale 5, Calif.*

Vacuum Oven—Redesigned Thelco Model 19, a new vacuum oven contains a hydraulic thermostat with a sensitivity of ±0.5° C. An all-welded heater bank of low-wattage density is claimed to reduce hazard from volatiles. Maximum temperature of 125° C. is reached in 19 minutes. The rectangular working chamber is of cast aluminum, with the door hinged at the top. Pyrex glass observation port provides interior visibility. Weight of the oven is 45 pounds. *Precision Scientific Co., 3737 Cortland St., Chicago 47, Ill.*

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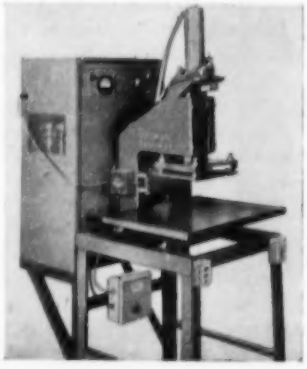


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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Handbook of Engineering Materials," by Douglas F. Miner and John B. Seastone

Published in 1955 by John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1382 pages. Price: $17.50.

Representing the combined efforts of 51 specialists from numerous fields, this source book brings together data concerning materials of manufacturing and construction in all branches of engineering for centralized identification and working comparison.

Arranged by classes of related or similar materials, the first section of the handbook provides general information on specifications and standards, application statistics, and mathematical and physical property tables. The second section is devoted to metals—pure and alloyed. The third section, dealing with nonmetals, contains a discussion of plastics, including types; classifications; general, electrical, mechanical, and chemical properties; and fabricating methods. An analysis of the differences between thermoplastic and thermosetting materials with 15 pages of charts and tables giving property data and characteristics, is included. The section on plastics concludes with discussions of laminates and silicones.

Cement, timber, glass, and similar materials of construction are covered in the final section of the book.

"Instruments for Measurements and Control," by Werner G. Holzbock

Published in 1955 by Reinhold Publishing Corp., New York 22, N. Y. 371 pages. Price: $10.00.

This book describes and illustrates currently used devices for measuring and controlling temperature, moisture, pressure, flow, uniformity, etc. In non-mathematical language, it discusses the design, construction, and operation of such instruments and points out factors to consider in choosing the proper instrument for a particular job.

Covered are the various process variables and the commercially available instruments for their measurement; analytical process instrumentation; devices used in controller actions; and final control elements such as valves, pumps, transformers, and motors. A special chapter discusses the development of centralized systems, miniaturization, and digital computers.

"Plastics and Building," by E. F. Mactaggart and H. H. Chambers

Published in 1955 by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. 181 pages. Price: $12.00.

An account of the chemistry, manufacture, and uses of plastics, with emphasis on their application in the building and allied industries is given in this volume. After an explanation of molecular structure and the chemistry of the synthetic polymers, a description of the manufacture of the various plastics presently in use and a study of the practical problems involved in their application is presented. Chapters concerning recent developments, future trends, and economics of the use of these materials are included.

Glossary—Second edition of "Glossary of Packaging Terms" contains approximately triple the number of terms in the first edition. It is a cloth-bound, hard-cover, 6- by 9-in. book containing over 250 pages of definitions, accuracy of which has been checked with acknowledged authorities in specific areas of packaging. Single copies $6.75; five to nine copies $5.95 each; ten or more copies $5.00 each. *Packaging Institute, Inc., 342 Madison Ave., New York 17, N. Y.*

Elastomers—Reprint of article entitled "The Tensile Strength of Elastomers," which appeared in Vol. XVII of the *Journal of Polymer Science*, discusses the effect of cross-linking and temperature on strength, and proposes a theory on the tensile strength of amorphous polymers. Results of experiments, together with graphs, tables, and mathematical analyses are given. *Mellon Institute, 4400 Fifth Ave., Pittsburgh 13, Pa.*

Adhesive bonds—An ultrasonic technique for non-destructive testing of adhesive bonds is described in report PB 111678. In this method, stainless steel, aluminum multi-ply laminates, and various laminated sample panels were subjected to vibrations developed by a ferro-electric transducer. Variations in voltage frequency curves were recorded and correlated with the strength of adhesive bonds. $1.00. *OTS, U. S. Department of Commerce, Washington 25, D. C.*

Plastics program—Brochure outlines courses, facilities, and degrees offered on undergraduate and graduate levels in a program of instruction and research in plastics. Information concerning admission, fellowships, assistantships, and housing is included. *School of Engineering, Princeton Univ., 30 Charleston St., Princeton, N. J.*

Custom molding—Services, facilities, equipment, and operations of a custom injection molding plant are described in this 40-page booklet. The step-by-step procedure involved in turning an idea into a molded product is outlined, together with a series of photographs which show the operations necessary in the various steps along the way. Typical products are illustrated and a thermoplastics properties chart is included. *Pyro Plastics Corp., Union, N. J.*

Molding compound—Technical data folder describes fibrous glass-reinforced plastics molding compounds for the production of lightweight, high-impact articles. Electrical, chemical, and physical properties are described. *The Plumb Chemical Corp., Philadelphia 37, Pa.*

Infra-red spectroscopy—Reprint of an article surveying the usefulness of infra-red spectroscopy as a research and development tool in the industrial laboratory, touches on the behavior of compounds absorbing infra-red energy, presents a number of infra-red spectra showing characteristic absorption bands of various



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Garbage pails
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Baskets for automatic washers
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Tool chests
Shipping containers
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Fluorescent light fixtures
Television cabinets
Loudspeaker housings
Gas meter housings
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Awnings and canopies
Greenhouse panels
Skylighting
Molded chairs
Prefabricated houses and garages
Truck bodies

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PITTSBURGH PLATE GLASS COMPANY

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compounds, and outlines possible applications. *Beckman Div., Beckman Instruments, Inc., Fullerton, Calif.*

Plastics catalog—Plastics welding and spraying equipment, large plastics moldings, weldments, and component parts for welded fabrications are presented in this condensed catalog. Dimensions, thicknesses, inner and outer diameters of pipe and tubing, and weights of stock pieces of the following materials are detailed in charts and tables: polyethylene, low-pressure polyethylene, irradiated polyethylene, and unplasticized P.V.C. A line of seamless ducting, sheets, rods, bars, and blocks of these materials is also listed. *American Agile Corp., P.O. Box 168, Bedford, Ohio.*

Insulating materials—Bulletin WC-1 presents the properties of four insulating and jacketing materials—polyethylene resins, Rulan chlorinated polyethylene, nylon resin, and tetrafluoroethylene resin. Uses of these materials for high-frequency insulation, high-voltage insulation, jackets, combination jacket-insulation, etc., are discussed. *Polychemicals Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.*

Molding compounds—Three thermosetting compounds—urea, melamine, and alkyd—are described in this four-page illustrated folder. Data on physical, electrical, and chemical properties, and moldability of the materials are given. *Allied Chemical & Dye Corp., Barrett Div., 40 Rector St., New York 6, N. Y.*

Mica insulation—Sixteen-page catalog M-55 describes the manufacture and use of mica insulation. Fabricated parts, plates, sheets, segments, tapes, tubes, and "V" rings are discussed in detail. Illustrations and charts give compositions, properties, and tolerances. *Continental-Diamond Fibre, Div. of The Budd Co., Newark, Del.*

Styrene—A series of pamphlets—55-192, 193, 194—covers types; physical, electrical, and chemical properties; processing; compounding; and uses of a high-impact modified styrene resin. Pamphlet 55-192 describes and presents charts of the properties of styrene for calendering. Pamphlet 55-193 discusses processing of the resin (calendering, laminating). Compounding is covered in pamphlet 55-194. *Chemical Div., The Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio.*

Nylon and polyethylene—Data on physical and chemical properties, and moldability of two nylon molding compounds, together with an analysis of polyethylene lubricants are presented in this illustrated folder. Charts listing properties of the materials are included. *Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.*

Dielectric core—Report PB 111692, entitled "Development of Heat-Resistant Foamed-in-Place Dielectric Core Materials for Sandwich Radomes," surveys methods of preparation of uniform foams. The reaction between alkyd resins and isocyanates to give a polyurethane foam and carbon dioxide; preparation of foams from unsaturated alkyd-triallyl cyanurate copolymeric materials; and inorganic foam derived from clay and a light weight filler are discussed. Performance data and properties are given. *$5.50. OTS, U.S. Dept. of Commerce, Washington 25, D.C.*

Silicone cores—Report PB 111558, entitled "Development of a Heat-Resistant Foamed-in-Place Low-Density Silicone Resin Core Material," describes methods of producing foamed-in-place sandwich cores, the most promising of which consists of expanding a dry powdered resin containing blowing agent, catalyst, and inert filler. *$3.00. OTS, U.S. Dept. of Commerce, Washington 25, D.C.*

Testing instruments—Catalog describes tensile testers, pressure gages, tachometers, thickness gages, speed indicators, mercury column pressure and vacuum gages, bursting strength testers, and cordage and paper scales. *Amthor Testing Instrument Co., 45 Van Sinderen Ave., Brooklyn 7, N. Y.*

Film packaging—How manufacturers, farmers, retailers, and consumers benefit from the packaging of hard and soft goods in polyethylene film is outlined in illustrated brochure J-795. The folder describes the use of film for packaging foods, plants, pills, clothing, hardware, etc. Physical and chemical properties of the polyethylene film are also listed, and its advantages are described. *Bakelite Co., Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.*

Vinyl and styrene resins—Processing of vinyl resins by calendering, extruding, molding, and casting or blowing is described in this pamphlet. In addition, properties of a high-impact modified styrene resin are listed. *Chemical Div., The Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio.*

Heat-transfer fluids—Technical data folder F-7490C describes advantages, properties, and applications of heat-transfer fluids derived from polyalkylene-glycol. A detailed graph and chart lists properties. *Carbide and Carbon Chemicals Co., a Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.*

Vacuum pumps—An eight-page booklet tells how and why a new line of diffusion and booster pumps was developed. Advantages of these Ring-jet pumps, together with a listing of other equipment such as mechanical pumps, vacuum valves, vacuum gages, vacuum furnaces, vacuum metallizers, etc., are given. Also offered is a vacuum calculator for rapid slide rule calculations, including standard ABCD log scale. *F. J. Stokes Machine Co., Inc., 5500 Tabor Rd., Philadelphia 20, Pa.*

Controlled-air power—This eight-page booklet, ML-3, describes a line of controlled-air power devices, including drill press feeds, vises, hydrochecks, rotary feed and index tables, self-contained drilling units, valves, and cylinders. *The Bellows Co., 222 W. Market St., Akron, Ohio.*

Diamond polishing—Advantages of diamond abrasives, both for rough grinding and in final polishing, are discussed in booklet No. 2. Charts giving comparative hardness and National Bureau of Standards grades necessary for roughing and finishing are included. *Abrasives Div., Elgin National Watch Co., Elgin, Ill.*

Plastics service—Bulletin 584 describes a laminated plastics service which consists of application engineering, research, fabrication, and

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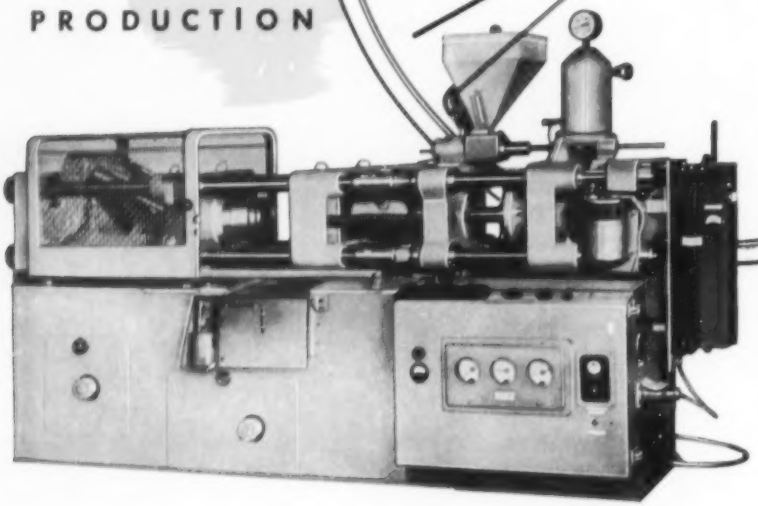
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(recently added) customer stock service. Photographs of the stock set-up and a chart listing electrical, chemical, and mechanical properties of Formica are included. *The Formica Co., 4717 Spring Grove Ave., Cincinnati 32, Ohio.*

Styrene tiles—Four-page folder AT-4 describes a line of 8½- by 8½-in. styrene wall tiles available in 11 colors and white, marbleized, and solid. Full-color illustrations of the tiles are included. *Miraplas Tile Co., 980 Parsons Ave., Columbus, Ohio.*

Controlled temperature—This bulletin describes the principle of forced recirculation of high-temperature fluid systems to provide controlled temperatures from 500 to 750° F. in process industries. *The International Boiler Works Co., 463 Beach St., East Stroudsburg, Pa.*

Paperboard—Booklet describes the characteristics of continuous sheeting of prescored corrugated board used for custom packaging. Advantages, applications, and availability of the product are discussed. In addition, data on shipping weight of bundle, length of unit bundle, width of sheet, etc., are given. *National Container Corp., 7 Central Park W., New York, N. Y.*

CSMA proceedings—Booklet covers the proceedings of the 41st mid-year meeting of the Chemical Specialties Manufacturers Association. Containing complete transcripts of more than 40 technical and marketing papers, it covers, in addition, reports of 1954 surveys of aerosol, insecticide, and brake fluid production. Work of the association's various divisions is also summarized. Lists of officers, committees, and membership, as well as copies of all official committee reports presented at the Chicago meeting are included. $7.50. *Chemical Specialties Manufacturers Association, 50 E. 41st St., New York 17, N. Y.*

Chemical literature—Two product bulletins analyze properties of several newly developed chemicals. One covers four ethers (E-121, 141, 161, and 181), which are described as commercial solvents and reaction media of high purity. The other bulletin describes D.M.B. (dimethoxy

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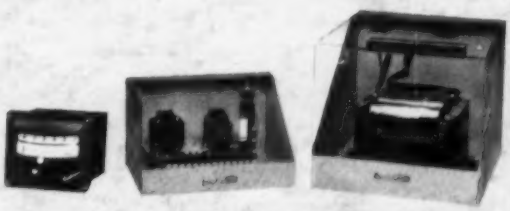
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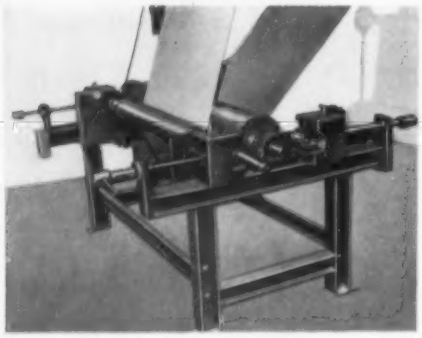
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benzene), a crystalline diether used as a sun screening agent and perfume ingredient in soaps, and H.A. (hydroxy anisole), a flaky solid used as a non-discoloring anti-oxidant and stabilizer for plastics and rubber, as well as a chemical intermediate. *Ansul Chemical Co., Marinette, Wis.*

Printing—A five-page technical service bulletin describes equipment, procedures, and paints used in screen-process printing on plastics. *Logo, Inc., 13799 South Avenue "O," Chicago 33, Ill.*

Control knobs—Pamphlet PB 111690 gives results of a study to determine the shapes of control knobs that make controls most readily distinguishable by touch alone. The report describes a number of knob shapes correctly identified in tests, grouped according to the characteristics that make them especially appropriate for particular functions. Test procedures and application suggestions are given. 75¢. *OTS, U. S. Department of Commerce, Washington 25, D. C.*

Rubber-covered rolls — Revised folder describes natural rubber-, Buna S-, Buna N-, and neoprene-covered rolls of various hardnesses for use by paper, leather, textile, plastics, packaging, abrasive, and other industries. Characteristics and applications of the various types are discussed. Specification data are also included. *Tyer Rubber Co., Andover, Mass.*

Polyethylene—Eight-page booklet, "Plastics for Engineering Construction—Polyethylene," details the molecular structure of polyethylene and discusses its mechanical, electrical, and chemical properties and characteristics. Tables indicating typical properties of structural polyethylene, and a chart presenting the weights per foot of seamless centrifugally cast tubing based on the inner and outer diameter, are included. *American Agile Corp., P. O. Box 168, Bedford, Ohio.*

Closures—Four-page brochure describes stock and custom molded plastics closures available to the drug, cosmetic, toiletry, and liquor industries. *Scott Plastics, Inc., 410 Windsor St., Hartford, Conn.*

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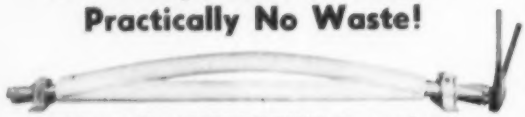


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PLASTICS AND SYNTHETIC RESIN PRODUCTION

From Statistics Compiled

Materials	*Total p'd'n first 8 mos. 1955*	*Total sales first 8 mos. 1955*
CELLULOSE PLASTICS:*		
Cellulose acetate and mixed ester		
Sheet, under 0.003 gage	12,124,362	12,166,812
Sheets, 0.003 gage and over	9,724,995	9,422,934
All other sheets, rods, tubes	5,025,043	4,561,562
Molding, extrusion materials	58,515,503	56,897,556
Nitrocellulose sheets, rods, tubes	3,178,809	3,329,246
Other cellulose plastics	3,979,007	3,548,037
PHENOLIC AND OTHER TAR-ACID RESINS:		
Molding materials*	135,956,012	126,913,877
Bonding and adhesive resins for:		
Laminating (except plywood)	41,150,764	32,628,126
Coated and bonded abrasives	36,157,122	26,974,756
Friction materials (brake linings, clutch facings, etc.)	16,724,544	15,232,941
Thermal insulation (fiber glass, rock wool)	31,127,490	31,246,731
Plywood	25,586,331	20,556,821
All other bond and adhesive uses	13,490,760	13,561,450
Protective-coating resins	16,881,570	16,518,296
Resins for all other uses	23,722,176	22,012,259
UREA AND MELAMINE RESINS:		
Textile-treating and textile-coating resins	26,846,450	25,712,016
Paper-treating and paper-coating resins	14,295,920	13,750,586
Bonding and adhesive resins for:		
Plywood	62,412,253	59,283,836
All other bonding and adhesive uses, including laminating	17,967,311	18,247,713
Protective-coating resins	25,041,243	18,675,435
Resins for all other uses, including molding	51,407,025	51,131,238
STYRENE RESINS:		
Molding materials*	266,190,852	244,302,891
Protective-coating resins	65,916,651	61,327,310
Resins for all other uses	54,752,521	52,862,822
VINYL RESINS, total**	451,471,558	422,388,245
Polyvinyl chloride and copolymer resins (50 percent or more polyvinyl chloride) for:		
Film (resin content)		55,667,999
Sheeting (resin content)		33,320,473
Molding and extrusion (resin content)		117,351,865
Textile and paper treating and coating (resin content)†		40,224,543
Flooring (resin content)		37,121,475
Protective coatings (resin content)		18,709,019
All other uses (resin content)		32,294,330
All other vinyl resins for:		
Adhesives (resin content)		20,931,336
All other uses (resin content)		69,767,204
COUMARONE-INDENE AND PETROLEUM POLYMER RESIN:	169,573,697	169,082,267
POLYESTER RESINS:		
For reinforced plastics	34,630,117	28,557,388
For all other uses	2,251,595	2,294,845
POLYETHYLENE RESINS:		
MISCELLANEOUS:		
Molding materials*,[d]	116,716,270	88,889,963
Protective-coating resins*	2,907,623	1,817,948
Resins for all other uses†	67,494,156	67,541,907

* Dry basis designated unless otherwise specified.
** Partially estimated. † Revised.
[a] Includes fillers, plasticizers, and extenders. [b] Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production are given. [c] Includes

IN POUNDS* FOR JULY AND AUGUST 1955
by U.S. Tariff Commission

*July***		*August***	
Production	*Sales*	*Production*	*Sales*
1,077,597	1,315,909	1,512,198	1,403,540
753,608	978,225	1,236,903	1,209,679
451,996	437,319	641,203	569,659
6,271,432	6,280,492	7,680,778	7,423,559
259,574	260,022	412,698	451,359
313,320	282,501	332,270	220,747
†12,069,002	†11,360,220	17,887,677	16,455,707
4,550,887	3,338,788	5,583,255	4,417,098
†931,927	†773,868	1,099,595	1,255,971
†1,531,923	†1,415,673	2,042,808	1,808,171
4,267,739	4,152,783	4,512,045	4,533,092
†2,961,198	†1,752,300	3,285,710	2,731,196
2,052,582	2,056,017	2,191,620	2,266,414
†1,828,538	†1,679,848	2,070,024	1,926,552
†1,922,623	†1,686,650	2,484,531	2,452,753
2,491,123	2,328,054	3,154,619	3,037,256
†1,577,010	†1,403,924	1,984,249	2,096,572
†6,598,280	†6,504,508	8,010,721	8,401,825
1,209,136	1,509,077	2,503,376	2,516,751
†2,648,863	†1,928,790	3,338,641	2,422,789
†5,234,375	†6,318,980	6,254,207	6,726,921
30,015,128	25,016,828	33,931,323	31,068,927
†6,952,245	†5,562,798	8,317,078	7,553,167
*5,733,417	*5,534,936	7,212,391	7,053,522
†54,628,239	†44,579,458	57,022,155	51,367,134
	5,925,370		6,477,682
	3,764,786		3,358,999
	11,943,012		13,265,299
	†4,290,731		5,135,925
	3,601,146		4,599,162
	2,027,715		2,104,670
	3,540,106		4,758,970
	†2,560,040		2,867,758
	†6,926,552		8,798,669
20,558,348	20,001,474	22,729,089	22,989,921
3,300,529	2,874,462	4,446,431	3,892,570
126,388	69,221	293,151	147,725
32,022,375	25,825,284	33,188,819	31,176,698
2,840,500	3,189,059	3,609,175	3,248,389
†318,902	†206,492	293,180	241,672
†6,105,194	†6,073,179	6,346,606	6,313,829

data for spreader and calendering-type resins. ‡ Includes data for acrylic, polyethylene, nylon, and other molding materials. * Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective-coating resins. † Includes data for acrylic resin modifications, nylon, silicone, polyethylene, and other plastics and resins for miscellaneous uses.

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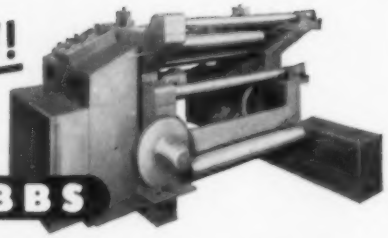
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Rugged molded urea enclosure is used to house motor of food blender

Motor Housing

ATTRACTIVE and durable motor enclosures which also serve as bases for food blenders are being molded of urea, chosen because the material is non-staining and resistant to greases and oils, as well as for its ruggedness and electrical insulating qualities. In addition, it is easily cleaned.

Urea molding material is available in a variety of colors, thus eliminating the need of painting or decorating the finished moldings. Turquoise, pink, yellow, and white were selected for the housings to satisfy today's demand for color.

Compression molded in a two-cavity mold on an H.P.M. 200-ton press, these enclosures surround a 90-w., 115-v. 60-cycle a.c. motor. Provided with removable stainless steel blades to obtain its no-splash spinner action, the blender will beat, mix, puree, whip, and blend frozen juices, ice cream drinks, cocktails, sauces, etc.

To operate the blender, liquids or solid foods which have been cut into small pieces are placed in the bowl. The open end of the bowl is covered and the food is blended and mixed by the action of the blades. When the desired degree of mixing has been attained, the bowl is removed from the motor housing and the contents poured.

CREDITS: Urea motor enclosure is molded by Breyer Molding Co., Chicago, Ill., using Plaskon urea supplied by Barrett Div., Allied Chemical and Dye Corp. Blender is a product of the Chicago Electric Div. of the Silex Corp.

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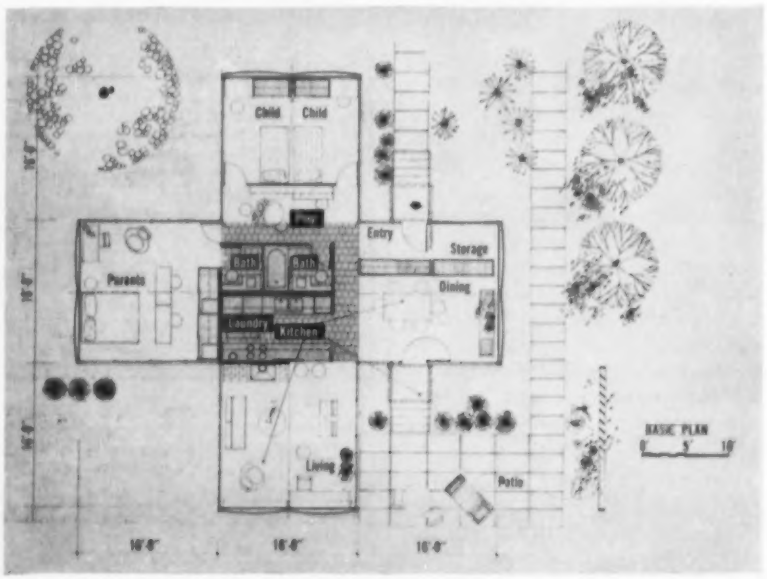
New Architectural Concepts in

FLINGING aside tradition-bound concepts of architectural engineering, recently completed preliminary plans for an experimental "house of tomorrow" take full advantage of the inherent design potential of plastics as applied to the field of building and construction.

The proposed structure, which will be erected primarily for demonstration and test purposes, is an outgrowth of a major research project in the sound use of plastics in building sponsored by Monsanto Chemical Co. and conducted at the Department of Architecture of M.I.T. As conceived by architect Marvin Goody and Richard W. Hamilton, director of the research project and research associate at M.I.T., the basis of the novel design is an 8- by 16-ft. molded module which is bent to form—in one piece—ceiling, wall and floor. It will also include integral wiring and other services. In the simplest plan (which is illustrated in the drawings below), eight molded modules are cantilevered in pairs from a 16-ft. square central utility core to form four 16-ft. square rooms. The utility core will contain bath, kitchen, laundry, and heating facilities.

Use of the molded module will represent a radical departure from traditional architectural practices





Architect's rendering and floor plan of experimental plastics "house of tomorrow," to be erected soon. Novel design involves use of cantilevered molded modules to form rooms. Variety of plastics materials is used for functional and decorative purposes

and may lead, according to engineers working on the project, to the development of truly production-line houses. By arranging the basic molded module components in different ways, a variety of initial floor plans is possible. Rooms may later be added or removed to conform with changing space needs.

Plans have not yet been finalized as to how these modules will be made and what materials will be used in their manufacture. Present conjecture is that it will probably be a sandwich structure. But whether the core will be a foamed plastic or a honeycomb and what the face material will be are still unanswered.

In addition to those used in the module, a great variety of plastics will find applications throughout the proposed building:

Lightweight, movable partitions and curtain walls will be made of sandwich material with a variety of core and face materials; decorative laminates (paper-, wood-, and cloth-base) will be used for walls, tables, and counter tops; shatterproof, lightweight panels in different colors and degrees of translucency, made of glass-reinforced plastics, will be used for light transmission and control; conduits, ducts, and piping, much of it integrally formed into wall and floor sections, will be made of flexible and corrosion-resistant plastics; gaskets and stripping will be extruded in various cross-sections and used to seal openings and join panel sections; foamed plastics will be used for insulation and textured surfaces.

At the present stage of planning, final choices of materials, site, method of manufacture, and the like, have not as yet been made. When the final decisions are reached they will be based on the results of the work done at M.I.T. under Monsanto sponsorship. (The nature of this work and its accomplishments to-date are contained in a publication entitled "Plastics in Housing," which was reviewed in MODERN PLASTICS 33, 188, Oct. 1955.)

Judging from the preliminary plans, the erection of the proposed structure will constitute a major milestone in the march of plastics toward full acceptance as prime materials of construction.



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We certainly would like to work with you in designing a planned label program. Why not call, write or visit Ever Ready today.

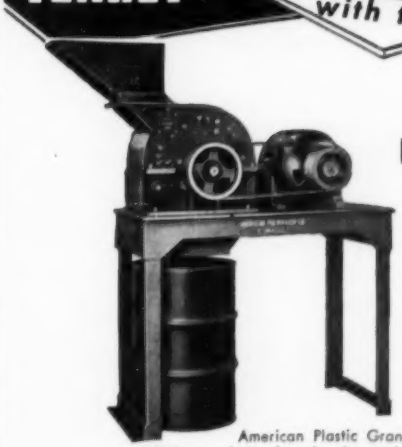
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Parts currently being made by Polygon in round stock range in size from 1/16″ to 4-1/2″ in diameter and any lengths. In addition to round stock, Polygon also manufacturers squares, rectangles, hexagons, channels, and other irregular shapes.

Polygon Extruded Tubing ranges in internal diameter from 1/16″ to 1″. Wall thickness can be varied from .010″ to any desired thickness.

Polygon serves the electrical industry with many proven applications such as coil forms, motor wedges, selenium rectifiers, spacers, brush holders, relays, controls, strain bar insulators, and other miscellaneous uses.

Polygon extrusions offer tremendous strength, excellent electrical properties, flexibility, hardness, low water absorption, and complete corrosion resistance. Listed below are some general specifications on the extrusions, but remember: these specifications can be altered to meet your requirements.

SOME GENERAL SPECIFICATIONS

Izod impact strength, ft-lb/in. notch, min.	17.1
Compressive strength, psi, min.	40,000
Flexural strength, psi, min.	64,000
Tensile strength, psi, min.	100,000
Modulus of elasticity	3×10^6
Barcol hardness	50
Water absorption, 24 hr, Max.	0.108%

Send today for samples and further information on how this amazing extruded material can help you meet "specs" and lick those tough design problems.

*The Polygon Plastic Company's continuous polymerization process is protected by patents.

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Complete line of Christmas novelties is molded of expandable polystyrene

Expanded Styrene Novelties

ATTRACTIVE three-dimensional novelty and advertising display pieces molded of expandable polystyrene make possible effects previously available only through the use of much more expensive materials. Produced in a variety of sizes, these economical 3D figures are being used this year for the first time in a complete line of Christmas novelties and decorations.

Expandable polystyrene was chosen because of a number of desirable properties—light weight, exceptional strength and durability, ease of coloring, resistance to chipping—and because it can be molded rapidly and inexpensively.

The figures are produced from tiny, hard polystyrene beads which have been impregnated with a special foaming agent. The beads react under heat and "pop" to fill the heated molds in a single operation, thus eliminating the need for additional machining and fabrication to complete the figures.

At the present time only three-dimensional bas relief plaques and stylized figures are being produced. However, the manufacturer is exploring the design possibilities of additional forms, as well as the practicability of making designs to specifications.

CREDITS: Display pieces and novelties, molded by Plasteel Corp., Inkster, Mich., of Dylite expandable polystyrene supplied by Koppers Co., Inc., Pittsburgh 19, Pa., are distributed by Frank Paper Products Corp., 2941 E. Warren Ave., Detroit, Mich.

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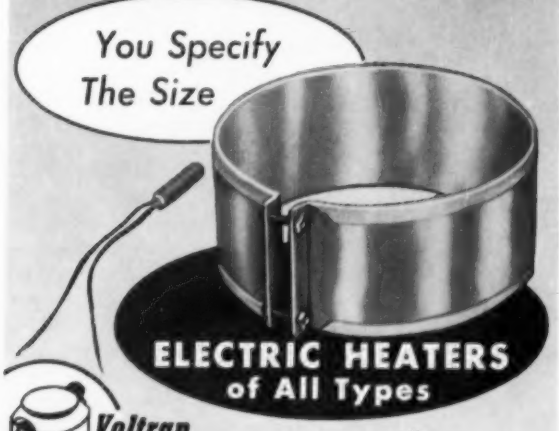
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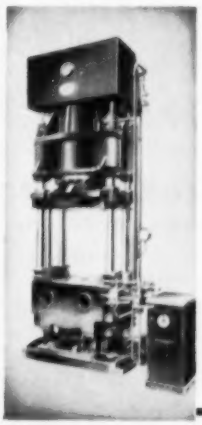


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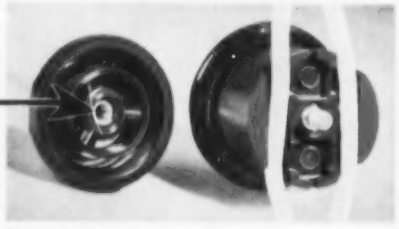
Amazing new techniques now permit the insertion of *ready-made, self-anchoring female threads* in molded plastic parts, die-cast alloys, powdered metals and other soft, light materials—*without costly drilling or tapping.*

Heli-Coil* PIP push inserts have been developed by the Heli-Coil Corporation over years of exhaustive research and testing. These PIP push inserts are pushed directly into cast or molded, blind or through-holes. They provide female threads for standard industrial specifications of thread fit (usually Class 2), often *at less than one cent per thread installed.*

For most production needs, tooling consists merely of a PIP mandrel, which is no larger nor more complicated than a drill or reamer. The mandrel can be used in any device having suitable stroke for pushing the PIP insert into the hole...a drill press, kick press, arbor press, or air piston will do. No rotation is needed. *A few dollars in tooling is all you need to set up for about 1200 holes per hour—per mandrel!* There is also available an automatic hopper-fed PIP push insert machine for use in quantity runs.

Send the coupon below for your free copy of our Standard PIP push inserts Application Chart. This unique chart will enable us to discover quickly without a salesman's call, whether ***Heli-Coil*** PIP push inserts will save you time and money. We maintain a top-flight staff of thread engineers and, if PIP push inserts are applicable in your case, we'll be glad to consult with you.

Electrical socket cap shows successful application of *Heli-Coil* PIP push inserts. Female thread in cap has sufficient strength to impale two covered wires on contact prongs.



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*Reg. U.S. Pat. Off.

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Greenhouse consists of reinforced plastics panels bolted to aluminum frame

Plastic Greenhouse

SHEETS of rugged fibrous glass-reinforced polyester laminate curved over a lightweight aluminum frame are being used to make portable greenhouses that are more durable and considerably easier to maintain than conventional glass types.

To assemble the greenhouse, which measures 11 by 10 ft., the semicircular aluminum frames are first bolted together. The 4- by 8-ft. reinforced plastics sheets are then attached to the frame with self-tapping screws. End sections, which are half reinforced plastics and half Masonite (and also include a door), are also screwed to the frame. If a longer greenhouse is required, several 11 by 10 ft. sections can be joined together. When not needed, the entire unit can be dis-assembled and stored in a relatively small space. Assembly takes only a few hours.

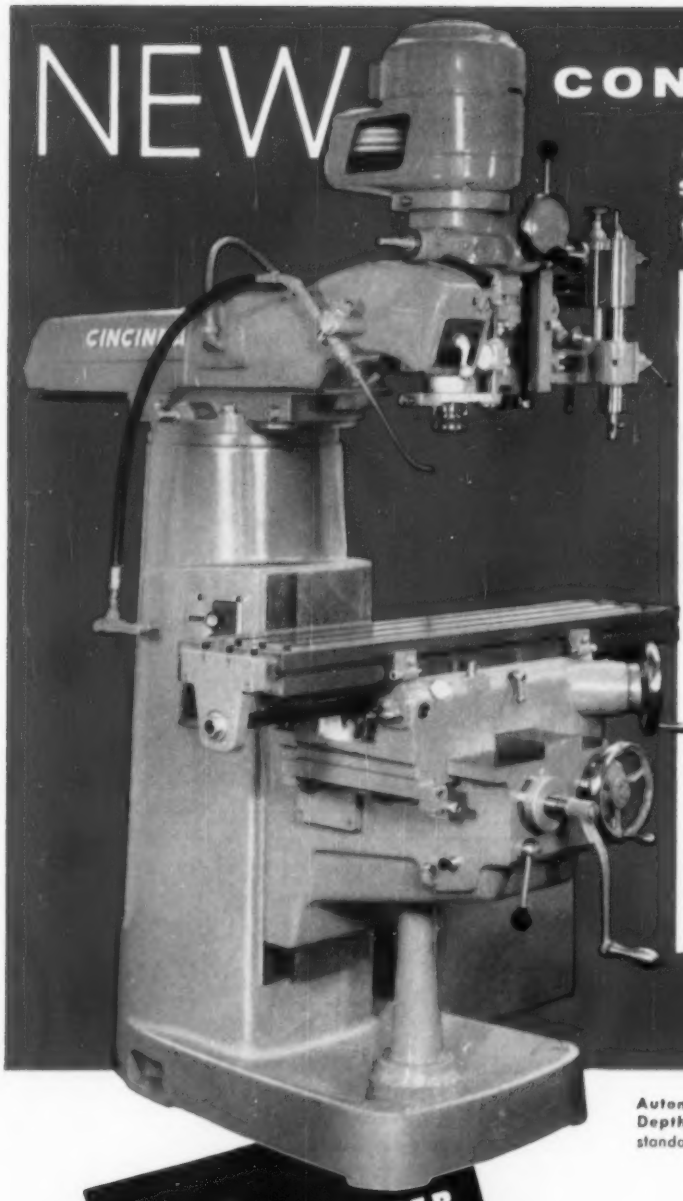
Since reinforced plastic sheets reflect heat, they do not have to be painted with whitewash during the spring and summer as is the case with glass panes. The 3/32 in. thick translucent white sheet allows approximately 65% of the available daylight to pass through, yet prevents excessive heat intensity from damaging young plants growing in the greenhouse.

Reinforced polyester sheets won't shatter or corrode, and are not affected by weather.

CREDITS: The portable greenhouse is produced by Russell Reinforced Plastics Corp., Lindenhurst, N.Y., using Vibrin polyester resin supplied by U.S. Rubber Co., New York, N.Y.

NEW CONTOURMASTER

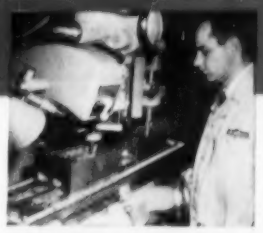
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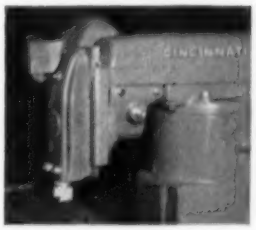
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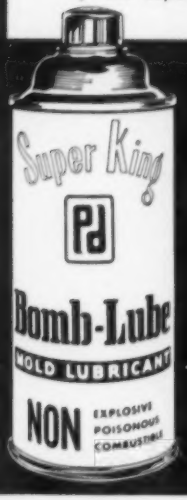
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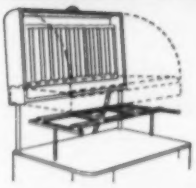
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Fluorothene, offering as it does high softening temperatures, resistance to burning as well as to moisture, a high degree of durability, and excellent electrical properties, provided the perfect answer.

CREDITS: Molded of Bakelite fluorothene for Linde Air Products Co. by Micro Products Engineering Co., both of Newark, N.J.



Molded fluorothene water adapters (top) used in welding torch (bottom, circle) resist heat as high as 400° F.



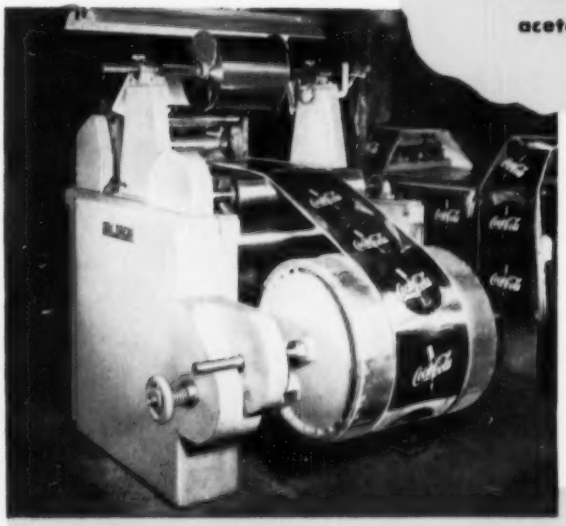
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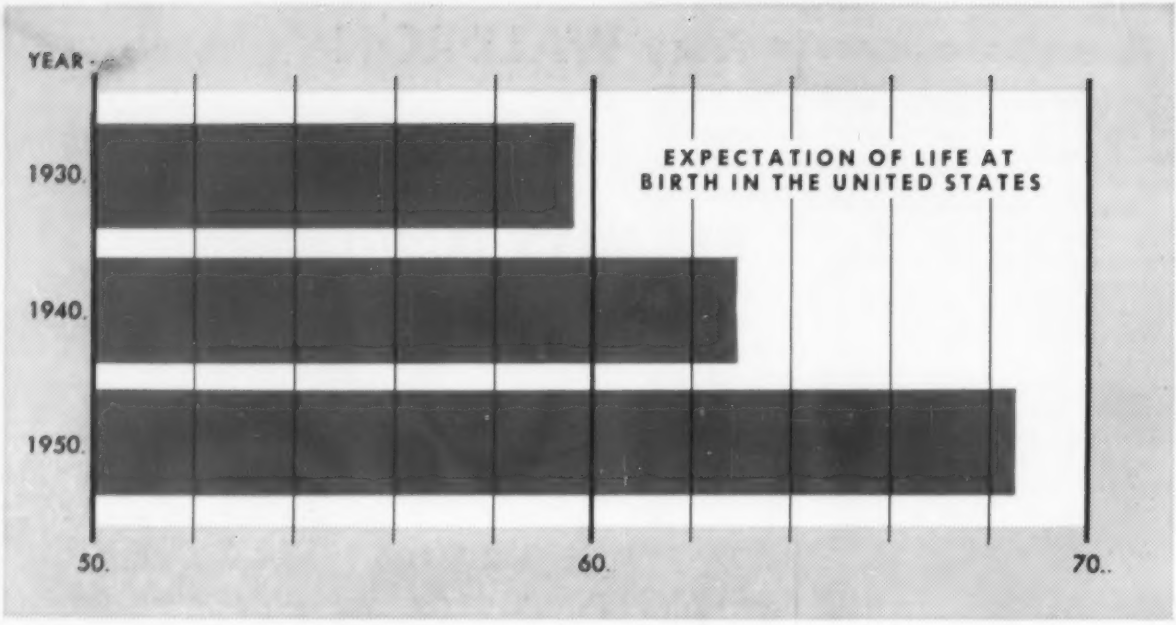
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EQUIPMENT • SUPPLIES • SERVICES

FABRICATION OF THERMOPLASTICS. Illustrated catalog describes line of welding and hot-spray equipment for fabricating thermoplastic materials; also lists stock sizes of "Agilene" polyethylene sheet, rod, ducting, block, tubing available. American Agile Corporation. (L-501)

PRINTING ON PLASTICS. Illustrated technical bulletin discusses screen process printing on plastics; covers basic equipment needed, how to do it, paints required. Also lists colors, bases, thinners for wide range of plastics. Logo, Inc. (L-502)

DESTATICIZED POLYSTYRENE. Technical folder describes "Kleestron D. S.," a permanently destaticized polystyrene material; topics covered include properties, injection molding technique, uses, differences from "standard" polystyrene. Kleestron, Ltd. (L-503)

DISPERSION RESIN FOR ORGANOSOLS. Technical literature gives physical and chemical properties, and instructions for use of "Pliovic AO," a vinyl chloride copolymer in organosols. Resin is fluid at room temperature. Goodyear Tire & Rubber Co., Inc. (L-504)

SMALL HYDRAULIC PRESSES. Illustrated catalog describes line of small, air-powered "Hydrolair" hydraulic compression presses, including models of 30, 50, 75, and 100 tons. Detailed specifications, optional modifications are given. Elmes Engineering. (L-505)

AIR AND HYDRAULIC CYLINDERS. Catalog-handbook gives complete details on extensive line of air and hydraulic cylinders and boosters, plus much useful information on hydraulic systems in general; data sheets, articles, etc. Miller Fluid Power Co. (L-506)

FIBROUS GLASS RADIANT HEATERS. Literature describes radiant heater which can produce surface temperatures in material from 120° to 700° F. with temperatures controllable to plus or minus 5°F. Zack Industries. (L-507)

HIGH SPEED MIXER. Illustrated literature describes features of "Entoleter" centrifugal mixer, capable of rates up to 250 lbs. per minute. Photos show results achieved with plastic compounds, pigments, other mixtures. Specifications and floor plans included. Safety Car Heating & Lighting Co. (L-508)

HOPPER-DRYER FOR MOLDING MACHINES. Illustrated folder describes hopper attachment that does continuous drying, preheating of material for injection and extrusion machines. Specifications included. Thoreson-McCosh, Inc. (L-509)

POWER SHEARS FOR PLASTICS. Illustrated catalog gives description and specifications of line of power-driven squaring shears adaptable to plastic sheet and laminates. Wysong & Miles Co. (L-510)

CUTTING, TRIMMING, PERFORATING EQUIPMENT. Illustrated booklet describes line of cutting, perforating, blanking and trimming dies, and electronic heat sealing dies. Western Supplies Co. (L-511)

METALWORKING MACHINES. Illustrated booklet gives information on line of machines for milling, broaching, die sinking and profiling, cutter and tool grinding, and electronic machining of metals. The Cincinnati Milling Machine Co. (L-512)

LAMINATED SHEET FABRICATION. 48-page booklet describes company's facilities for fabrication of insulation from wide range of materials. Also catalogs extensive stocks of laminated and vulcanized sheet and rod materials. Manne-Knowlton Insulation Co., Inc. (L-513)

USES OF TEFLON. Illustrated bulletin describes and discusses uses for "Teflon" tetrafluoroethylene parts in industry. Lists stock rod, tube, gasket and packing sizes available. Crane Packing Co. (L-514)

FABRICATING TECHNIQUES. Manual gives instructions on fabricating glass mat reinforced polyester sheet by sawing, punching, drilling, tapping, cementing, shearing, etc. The Glastic Corporation. (L-515)

CARBON BLACK DISPERSIONS. Brochure describes uses, characteristics, compositions of company's line of carbon black pigments, available in many resin vehicles and in dry, semi-liquid, paste, and bead forms. Acheson Dispersed Pigments Co. (L-516)

AIR AND HYDRAULIC CYLINDERS. Illustrated catalog gives specifications, dimensions for line of pneumatic and hydraulic power cylinders, available in many mounting styles; used for holding, feeding, indexing, automation applications. Hanna Engineering Works. (L-517)

SET SCREWS. Illustrated folder describes types of 18 set screws, including two models designed for use on plastics: a headless hopper-fed type for high-speed application and a headless self-tapping screw. Set Screw & Mfg. Co. (L-518)

RELEASING AND BACKING PAPERS. Illustrated folder describes line of parchment papers with good releasing action from sticky surfaces. Uses: strippable backing for self-sticking tapes, sheet and film products. Samples included. Paterson Parchment Paper Co. (L-519)

CADMIUM PIGMENTS. Data sheets give details on composition, properties, uses, and available shades of company's concentrated cadmium reds and yellows, described as having extremely high tinting strengths. General Color Co. (L-520)

THERMOSETTING TOOLING RESINS. Bulletin describes, lists properties of "Ren-ite" products used in laminating and casting work; includes resins, hardeners, fillers and special purpose mixes. Ren-ite Plastics, Inc. (L-521)

ELECTRONIC PREHEATER. Data sheet gives specifications of portable electronic preheater with heating capacity of 18 pounds per minute. W. T. LaRose & Associates, Inc. (L-522)

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SCRAP GRANULATOR. Illustrated data sheet gives specifications of one-horsepower granulator with capacity of up to 50 lbs. of rigid thermoplastic scrap per hour. Van Dorn Iron Works. Co. (L-523)

EDGE BEADER FOR SHEET STOCK. Illustrated brochure describes machine that can form nine types of beaded edges on all kinds of thermoplastic sheeting, .005 to .020 inches thick, at speeds from 500 to 1000 inches per minute. Taber Instrument Corp. (L-524)

EXTRUDING EQUIPMENT. Illustrated literature lists specifications and describes company's full line of thermoplastics extruders and accessories. National Rubber Machinery Co. (L-525)

HEAT FOR PLASTICS PROCESSING. Illustrated 36 page booklet presents 25 case histories showing how "Chromalox" strip, ring, tubular, or cartridge heating elements can be advantageously used in plastics processing operations. Edwin L. Wiegand Co. (L-526)

SPRAY MASK PAINTING MACHINE. Illustrated folder describes three models of a high-performance automatic spray mask painting machine. Specifications included. Sepanski & Associates. (L-527)

INDUSTRIAL MASKING TAPES. Folder illustrates many uses for "Scotch" pressure-sensitive tapes, incuding paint masking, protecting, sealing, and splicing; lists physical properties of 12 types of tapes, shows various dispensers. Minnesota Mining & Mfg. Co. (L-528)

SPRAY EQUIPMENT. 71-page illustrated catalog describes extensive line of spraying equipment, including apparatus suitable for spraying resins used in reinforced plastics molding and for spraying paints and coatings. Binks Mfg. Co. (L-529)

HANDBOOK ON INDUSTRIAL OVENS. Illustrated handbook gives much useful information about various types of ovens, how to select one, principles of heat energy, oven design, hints for proper oven operation, choosing a fuel, etc. Michigan Oven Co. (L-530)

FOAMED POLYSTYRENE MANUAL. Illustrated manuel presents comprehensive information on properties, characteristics, and applications for "Dylite" expandable polystyrene. Gives detailed molding and fabricating information. Koppers Co., Inc. (L-531)

VACUUM SYSTEM MACHINE. Illustrated data sheet describes, gives specifications for three models of vacuum system machines with 12-, 14-, and 18-inch chamber diameters; recommended for pilot plant work in vacuum metallizing. Consolidated Vacuum Corp. (L-532)

HYDRO-PNEUMATIC ACCUMULATORS. Illustrated bulletin describes function, construction, operation, and lists specifications for line of accumulators that store hydro-pneumatic power. Gives formula for selecting proper size. Greer Hydraulics, Inc. (L-533)

DIE-MAKING EQUIPMENT. Illustrated catalog describes line of die-making equipment: table and jig saws; drills; and benders, cutters, and bridgers (including combination models). Also outlines complete outfit for making folding carton and fancy dies. J. A. Richards Co. (L-534)

SCREEN PROCESS PRINTING PRESSES. Illustrated bulletin gives data on two models of press that prints on plastic sheeting, foil, other materials. The larger model accepts sheets up to 19 by 25 in., prints up to 2500 per minute. General Research & Supply Co. (L-535)

PLASTICIZER FOR VINYL COMPOUNDS. Technical bulletin describes "Panaflex BN" secondary hydrocarbon plasticizers, and discusses typical formulations for their use with dipping compounds, foam vinyls, and spray or dip coatings. Pan American Chemicals Corp. (L-536)

PLASTICS FOR ELECTRONICS. Catalog contains technical bulletins on line of casting and laminating resins, plastic foam materials (rod, sheet, or molded to order), polystyrene rod and sheet stock, and impregnants. Emerson & Cuming, Inc. (L-537)

CUSTOM MOLDING SERVICE. Illustrated literature describes company's custom injection, compression, extrusion, and reinforced plastics services, including double-shot injection molding and other special techniques. American Plastics Corp. (L-538)

COLORANTS FOR POLYESTER RESINS. Technical bulletin describes line of iron oxide colorants for producing opaque, transparent, and translucent color-shades. Gives test data, coloring formulae, prices. Reichard-Coulston, Inc. (L-539)

GLASS FABRICS SPECIFICATIONS CHART. Chart gives details on weight, weave, breaking strength, thickness and finishes of extensive line of glass fabrics produced and supplied by this company. J. B. Schwebel & Co., Inc. (L-540)

PLASTICS PRIMER. 24-page pamphlet discusses in detail such topics as properties and uses of various plastics; molding methods; mold-making and mold costs. Also describes company's molding facilities. Chicago Molded Products Corp. (L-541)

GRINDING AND FINISHING EQUIPMENT. Illustrated catalog presents specifications and descriptions of line of hand tools and accessories for grinding, polishing and buffing of metals and plastics. Foredom Electric Co. (L-542)

SPRAYED METAL TOOLING. Illustrated literature describes sprayed metal molds used in various low-pressure molding operations; also describes the procedures in fabricating sprayed metal tooling. Metallizing Engineering Co., Inc. (L-543)

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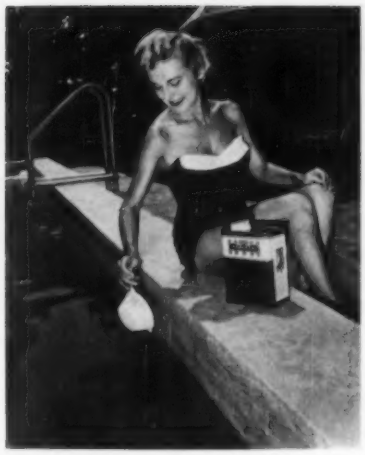
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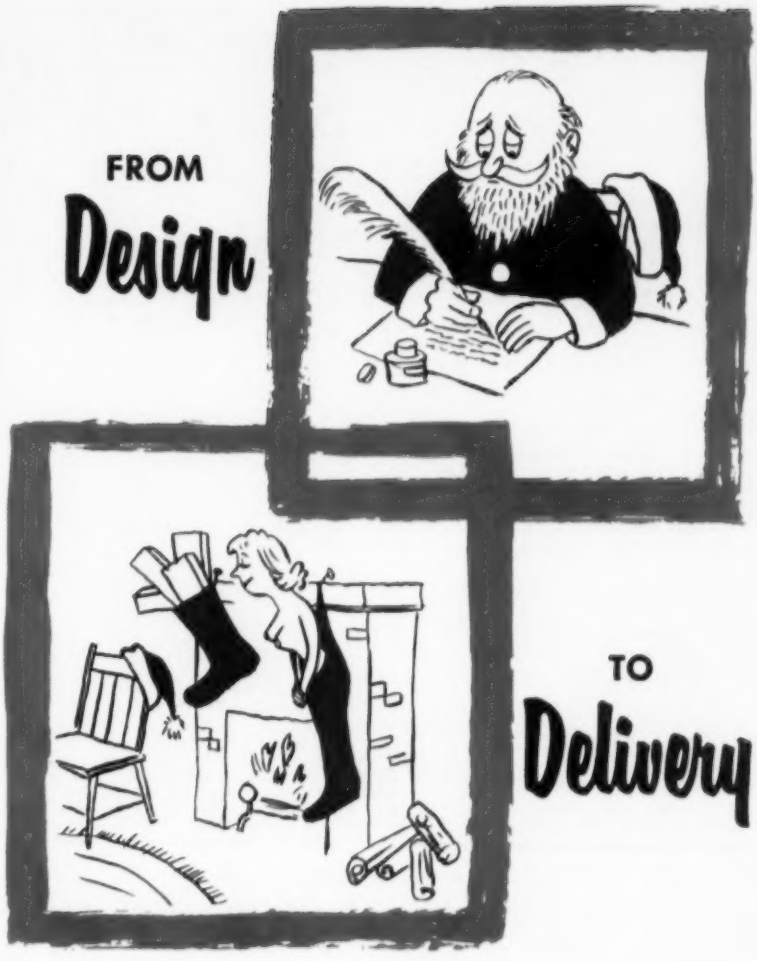
Chlorination System

A NEW, economical, and easy method for chlorinating swimming pool water makes use of a flexible, corrosion-resistant polyethylene basket as a dispensing container for chlorine-carrying tablets.

When using the system, the basket is simply filled with a proper quantity of tablets (known as HTH tablets) and suspended by hook, lacing, or rope at appropriate points around the pool and beneath the surface of the water. As the tablets dissolve, chlorine is added to the water in sufficient dosages to keep it in a purified condition throughout the rest of the day's use.

The polyethylene basket, which is about 2 in. deep and about 6 in. in diameter, is molded in two parts joined together at one end by a thin flexible strip that serves as an integral hinge. The bottom half of the basket is molded in an open criss-cross pattern that provides for rapid and free removal of the hypochlorite solution as it is formed. Projecting studs molded into flaps along the sides and front of the bottom half fit into a series of matching holes molded into flaps along the rim of the flat cover to provide an easy means for securely locking the two parts together.

CREDITS: Baskets are molded for Olin Mathieson Chemical Corp., Baltimore, Md. (originators of the HTH chlorination system) by Dapol Plastics, Inc., Worcester, Mass., in a 6-oz. Impco machine using polyethylene supplied by Bakelite Co.



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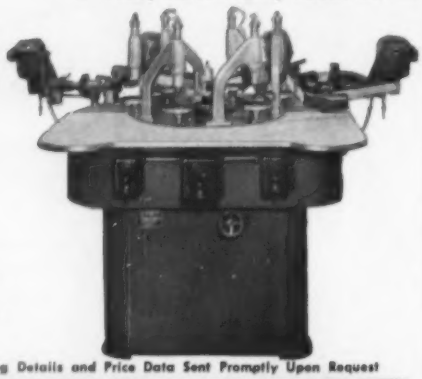
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Polyester Pallet

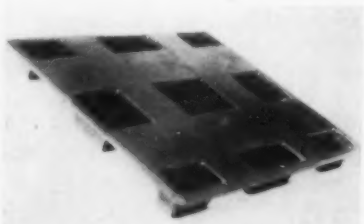
CAPABLE of supporting a 3000-lb. load, a new materials handling pallet is being made of durable, tough fibrous glass-reinforced polyester. The exceptional strength of reinforced plastics, combined with their resistance to wear, abrasion, and impact were major factors in their selection to replace other materials previously used for this purpose. In addition, the reinforced plastics pallet weighs only 28 pounds.

This high strength-weight ratio is obtained by a sandwich-type construction in which a balsa wood core and polyester resin-bonded fibrous glass mat skins are used. The lay-up is made by hand of strips of mat and pieces of balsa wood which are cut to approximately the size and shape of the female half of a cast Meehanite mold. The lay-up is then placed in the mold and cured at temperatures of from 180° to 220° F. for approximately 10 min. under a pressure of 600 p.s.i. Flash is removed with an abrasive cut-off wheel.

Because of the flexibility and resilience of the reinforced plastics materials, the pallet will not crack or splinter even with rough handling; the strength and rigidity increase at sub-zero temperatures and the pallet is not affected by rot or rust. It is resistant to alkalies, oils, greases, and acids, and the surface is easy to keep clean and sanitary by steam sterilizing up to 325° F.

The supporting legs of the pallet, which are hollow and molded in one piece with the platform they support, are spaced to allow a four-way approach for fork-lift trucks.

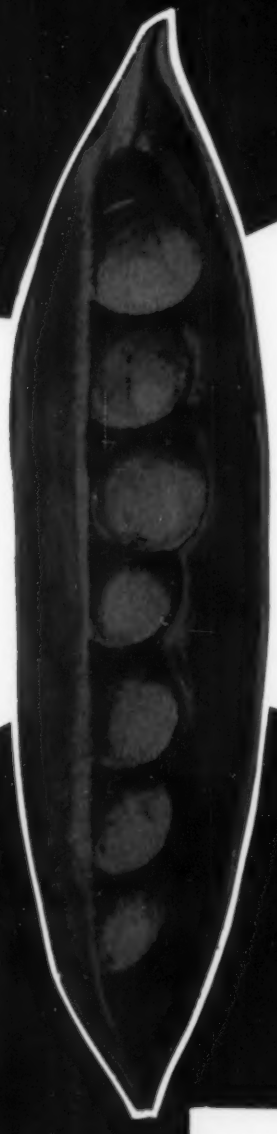
CREDITS: Molded of Bakelite polyester resins reinforced with Fiberglas supplied by Owens-Corning Fiberglas Corp., the pallet is made by Firmaline Products, Inc., Midland Park, N. J.



Reinforced plastics pallet is tough, durable, will support 3000-lb. load

colors for the plastics industry...

as uniform as two peas in a pod



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Plastics Linings

(*From pp. 85-91*)

ing from ¼ to ½ in. thick. In contrast, the new laminate, which consists of gray rigid polyvinyl chloride sheet on one side and an elastomeric copolymer on the other, can be adhesive-bonded directly to the metal. As a result, a much thinner gage of the rigid PVC may be used.

Polyethylene Sheet

Sheet polyethylene material also finds extensive use as a tank liner. Weighing only 1/13 as much as lead (a metal widely employed in anti-corrosion installations), and considerably more resistant to corrosion than stainless steel and other high-priced alloys, polyethylene in sheet form may be conveniently fabricated by the hot gas welding technique. Unlike polyvinyl chloride, polyethylene does not lend itself to cementing techniques. American Agile Corp., Bedford, Ohio, produces a number of tank liners of sheet Agilene (polyethylene) by means of the heat welding method.

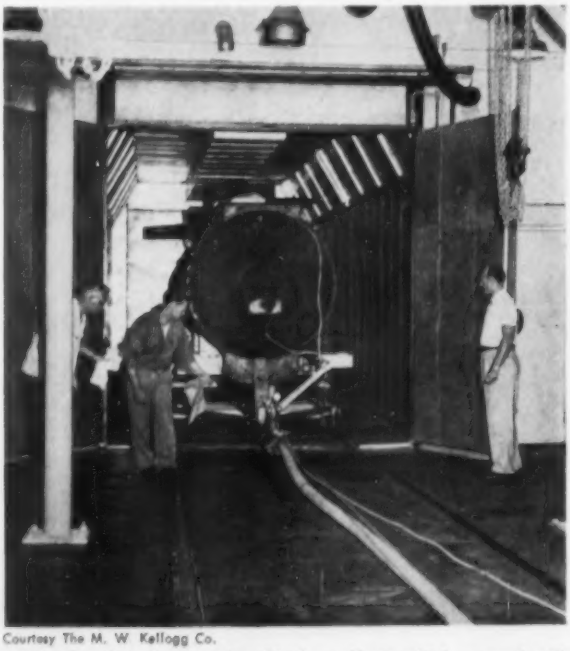
Resin-Glass Laminate

Laminates comprised of fibrous glass in combination with polyester resins are another type of plastics frequently used for fabricated tank liners. Such liners offer excellent chemical resistance and are also exceptionally sturdy. They are particularly suitable in electroplating applications, since they resist many of the solutions commonly encountered in these operations. Since the material is thermosetting, there is no tendency for it to soften, sag or "grow" in service.

A typical example of the use of reinforced plastics in this field is a trough liner produced by The Chemical Corp., Springfield, Mass., for United Wire & Supply Co., Cranston, R. I. This liner, used in an acid cleaning process for drawn aluminum tubing, measures 24 ft. long and 3 ft. deep. It was molded in prefabricated panels of Laminac polyester resin supplied by American Cyanamid Co. and fibrous glass supplied by Owens-Corning Fiberglas Corp. and is welded together with strips of Laminac-impregnated glass cloth. Similar laminates are also used in the fabrication of processing and storage tanks for petroleum products, chemicals, etc.

Plasticized Vinyl Sheet

Flexible membrane linings, composed of specially formulated types of rubber or plastic materials, mark another method of incorporating



Courtesy The M. W. Kellogg Co.

Inside of tank trailer used for shipping sulfonic acid is sprayed with a Kel-F dispersion and then rolled into an oven for final cure

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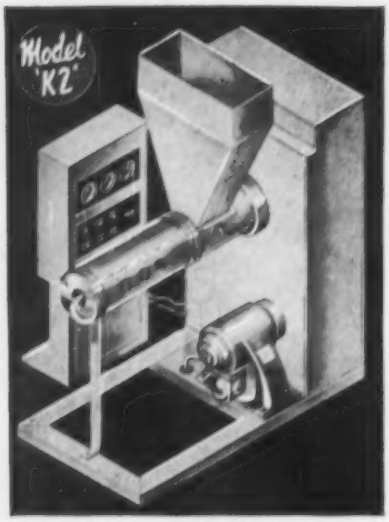
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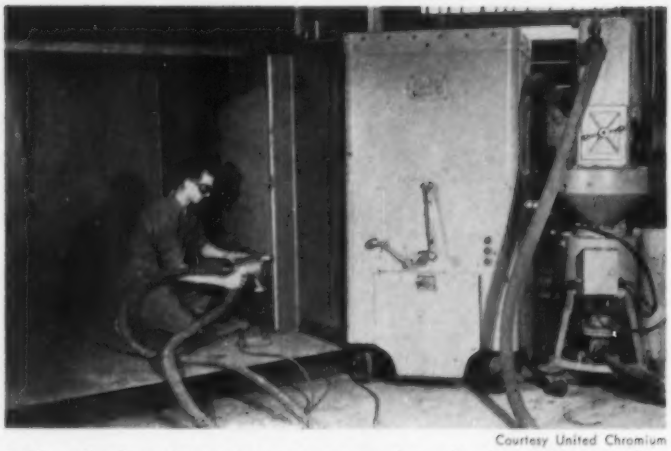
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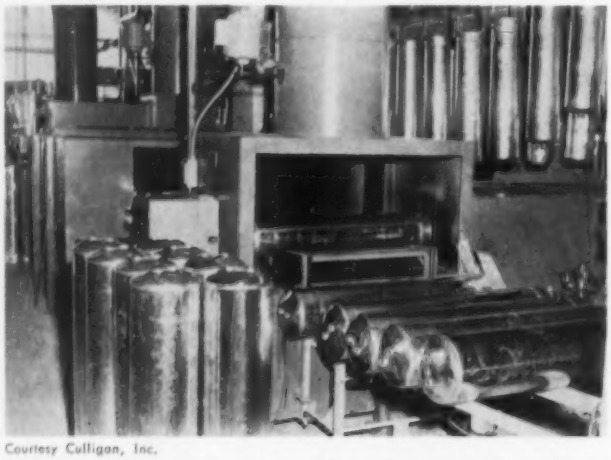
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Courtesy United Chromium

Inside walls of metal processing equipment are thoroughly cleaned before application of vinyl plastisol. After cure, vinyl fuses into continuous protective coating



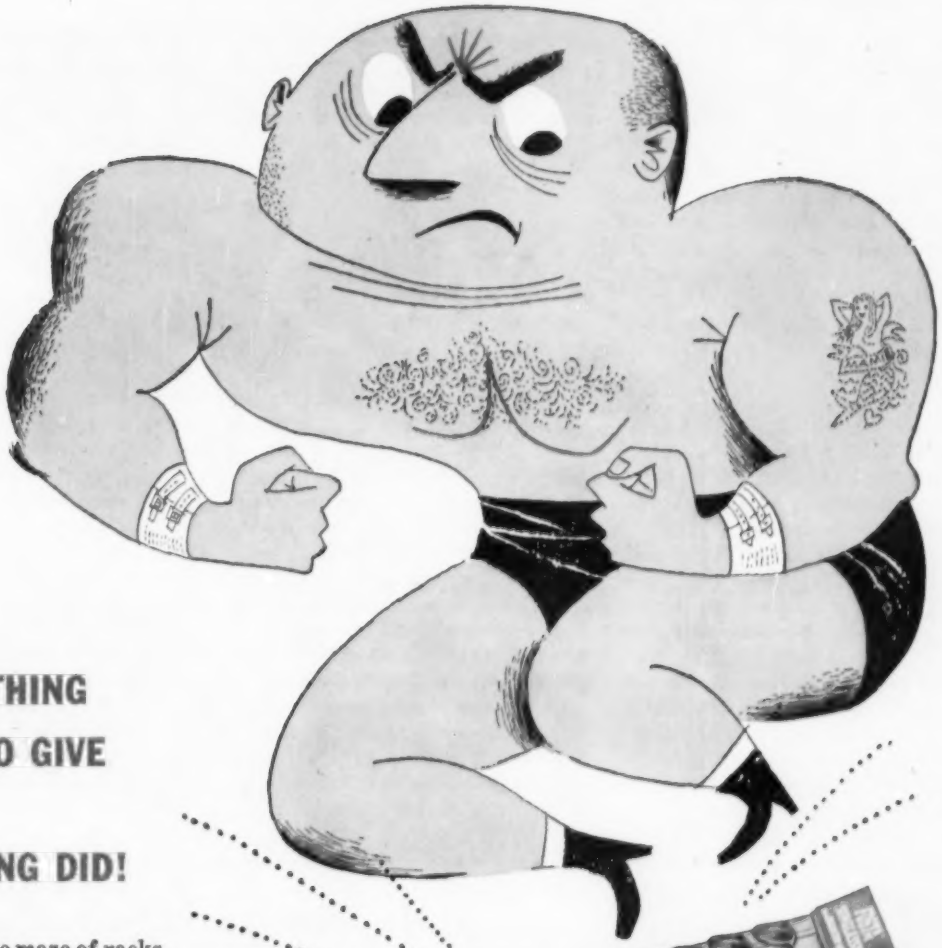
Courtesy Culligan, Inc.

At automatic spray station, interior surfaces of water-softening tanks are coated with three successive layers of a modified epoxy resin

corrosion resistance in a tank or vessel. For this purpose, plasticized polyvinyl chloride sheeting does an excellent job, particularly when operations involve the use of strongly oxidizing solutions. Highly wear- and tear-resistant and electrically non-conductive, they are applicable as linings to wood or concrete vessels as well as steel. They are not affected by most acids and are notably superior to rubber linings in resisting nitric and chromic types. When used as a membrane lining material, plasticized polyvinyl chloride is suitable for direct temperature exposures up to approximately 150° F. in the presence of most acids, corrosive salts, and alkalies. Customarily, linings of this type are installed by firms specializing in industrial corrosion control. Thicknesses used generally range from 1/16 to 3/16 inch. Among companies supplying membrane linings are Nukem Products Corp., Buffalo, N.Y., and Atlas Mineral Products Co.

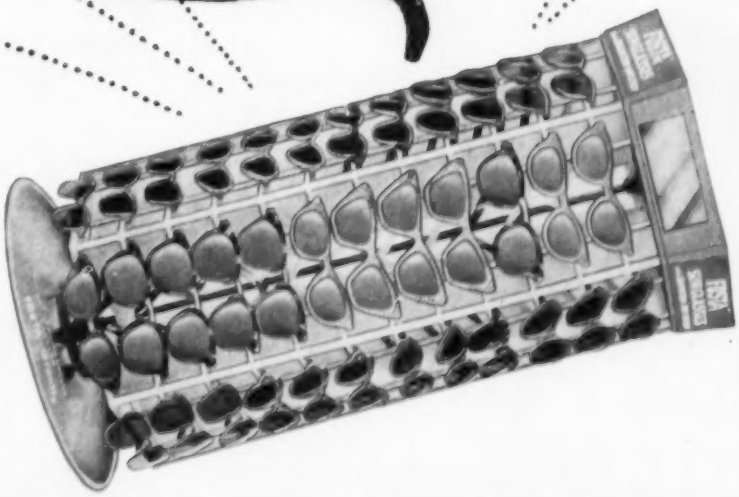
Kel-F Laminate

One of the newest and most effective corrosion-resistant lining materials made available to industry is a Kel-F laminate, developed by The M. W. Kellogg Co., Jersey City, N. J. This new structural material makes it possible to line even large fixed tanks and vessels with a layer of polychlorotrifluoroethylene resin. Outstanding properties of the new laminate, in addition to its extreme resistance to acids, alkalies, oxidants, and solvents, include low vapor permeability, zero moisture absorption, high mechanical strength, excellent



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electrical properties, and wide temperature range.

The new material consists of a thin, continuous layer of Kel-F plastic applied to the face of a glass cloth, and penetrating sufficiently into the glass structure to provide a strong mechanical bond between plastic and fabric. On the reverse side, the glass cloth not saturated with resin provides a gripping surface for conventional adhesives. In the standard weight laminate, total thickness is 23 to 26 mils; the layer of Kel-F is about 10 to 12 mils.

Vessels ranging from simple, rectangular plating tanks to complex reactors involving flanged pipe connections may be lined throughout with this type laminate.

The new laminate is supplied commercially in sheets approximately 36 by 46 in. in size; longer sheets 36 in. wide can be made on special order. Although stiffer than rubber or vinyl linings, the sheets can be cut with a knife or tailor's shears and fitted to almost any type of flat surface or contour having a simple curvature. Complex curvatures can be covered by using hot-forming or cold-forming techniques. At present, the best all-purpose adhesive for cementing the laminate to most surfaces are the fluid epoxy-Buna N formulations. Butt joints may be sealed with Kel-F tapes.

Liquid Coatings

While most of the foregoing discussion has dealt with lining materials in the form of flexible membranes, film, rigid sheet, or laminates, in some types of applications it is more convenient or practical to make use of a lining material which can be applied in the form of a liquid coating. This is particularly true in instances where the shape of the unit or its interior inaccessibility make application of other types of linings difficult.

Anti-corrosive coating agents can be used both for the storage tanks and processing vessels as well as for other containers described above.

Liquid coatings fall into two general types—thermosetting and thermoplastic. The majority of the thermosetting coatings are based on phenolic resins, while vinyl chloride resins dominate the thermoplastic group. In general, the thermosetting coatings have higher temperature resistance than the thermoplastic type, but are inferior in mechanical shock resistance.

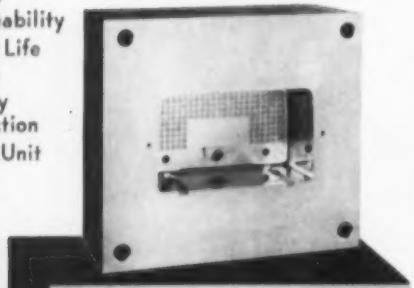
Phenolic Coatings

Phenolic coatings of both the baked-on and cold-setting types are produced by Ric-Wil Plastic Coating & Mfg. Co., Cleveland, Ohio. Most of these coatings can be applied by brush, spray, or dipping for convenient application, and are said to offer complete resistance to all corrosive solutions except those containing strong oxidizing acids, hydrofluoric acid, bromine or chlorine compounds in very high concentrations, and strong caustic alkali solutions above 30% concentrations at elevated temperatures.

Where the use of a baked-on type coating (e.g. Ricwilite 1060) that polymerizes at 350 to 400° F. is impracticable, a cold-set phenolic resin such as Ricwilite 7100 may be used. Polymerization takes place at room temperature, through the addition of a catalyst just prior to application;

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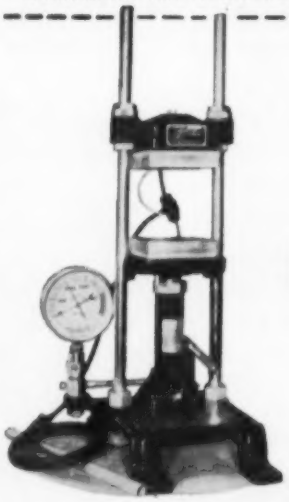
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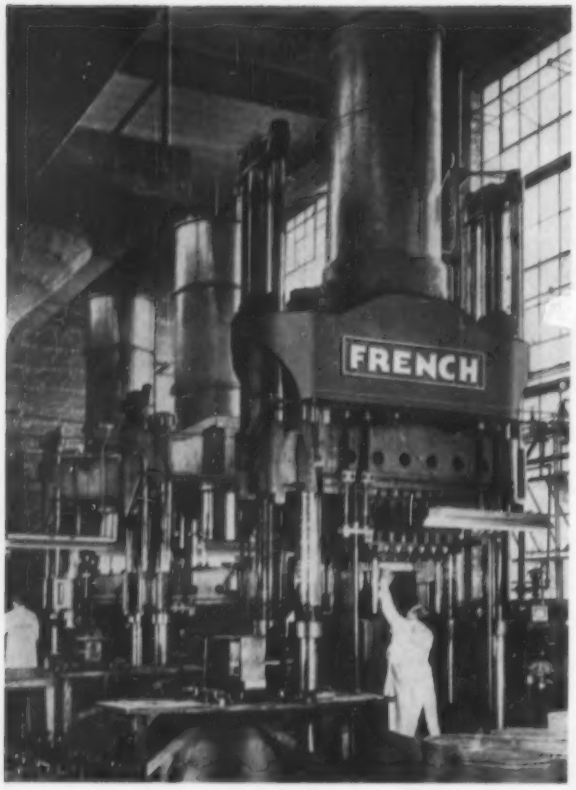
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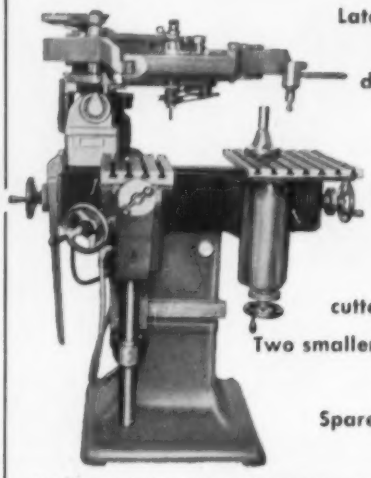
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this material, having excellent resistance to strong acids, alkalies and solvents, has been successfully used as a protective lining for metal and wood mixing and processing tanks and tank cars. Tack-free in 3 to 4 hr. the coating requires 7 days for a complete cure. Applied by brush or with standard spray equipment, it may also be used in combination with glass cloth for lining and sealing wood storage tanks and sealing cracks in concrete tanks. It is said to possess excellent flexibility.

Among other producers of phenolic-based coatings are Nukem Products Corp. and A & P Finishing & Mfg. Co., Detroit. TS-100, made by the latter firm, is a phenolic type coating widely used as a lining for food, chemical, and pharmaceutical processing equipment, drums and containers, plating tanks, tank cars, and storage tanks. Its heat resistance permits use at temperatures up to 325° F.

Vinyl-Type Coatings

Nukemite 35, produced by Nukem Products Corp., and TP-100, TP-110, and TP-500, made by A & P Finishing & Mfg. Co., are representative of the vinyl-type coatings widely used as protective linings. Nukemite 35 is described as a high resin content, heavy viscosity finish suitable for steel and concrete tank linings. A high-solids solution of vinyl copolymer resins, it is said to form a film thickness about four times heavier than obtained with many conventional types of coatings. Its heavy viscosity permits the building up of a complete membrane in three to five applications. The finished film, it is stated, equals and often excels the performance of sheet linings; also, like the latter, it can be tested for pinholes with a dielectric tester. This type coating is intended for use where no mechanical punishment is involved and where continuous operating temperatures do not exceed 140° F. For more severe conditions, the lining can be supplemented by protective acid brick sheathing.

A & P's TP-110 is a durable baked vinyl-type material, especially formulated for use as a coating or lining for tanks, duct systems, etc. This coating can be applied in thicknesses ranging from 10 to 100 mils and will withstand temperatures up to 250° F. on intermittent service applications. Shipping containers, hot water tanks, and chemical processing equipment represent typical applications. The flexibility of linings composed of TP-500 vinyl coatings, along with their excellent chemical resistance, makes them particularly suitable for use in mobile equipment used in processing, handling, or transporting various chemicals, such as chromic, nitric, and spent sulfuric acid.

Among the variations of vinyl coatings that can be applied to even intricately shaped equipment are the vinyl dispersions (see "Have you looked at vinyl dispersions lately?" MODERN PLASTICS 33, 106, Nov. 1955).

Another variation in vinyl coating materials is a copolymer of vinylidene chloride and acrylonitrile, now in use by the U. S. Navy to coat the interior of fuel tanks of ships and aircraft to withstand the action of aviation gas, sea water, and hot water cleaning sprays. According to Navy reports, the tanks previously used required costly repairs after only six years use and had to be

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completely rebuilt after 12 years. With the new plastics coatings, the tanks are expected to last indefinitely.

Epoxy Coatings

Culligan, Inc., Northbrook, Ill., world's largest producer of water conditioning equipment for the home, recently adopted a corrosion-resistant modified epoxy coating, called Cul-Dur, for its 1955 line of water softeners. Accelerated laboratory tests and field studies have proved tanks with the new-type linings will not fracture under normal stress and temperature changes and are far more corrosion-resistant than conventional galvanized tanks, which sometimes last less than three years in areas where the water is extremely corrosive.

In the coating installation designed by Culligan engineers, an automatic machine first sandblasts the tank interiors to assure proper adhesion of the coating to the metal. Washed and dried, the tanks then move by conveyor belt to a series of three fully automatic paint spray stations which evenly coat their interiors with the plastic coating. After each coat, the tanks are inspected and run through drying ovens. Then they are finally dried and cured in a giant baking oven for 30 minutes.

Polyethylene Coatings

Coatings from thermoplastic materials which do not readily dissolve in common solvents at normal operating temperatures, such as polyethylene, may be applied as linings by means of a flame spraying technique. Utilizing a flame spray gun into which the polyethylene molding powder is fed at a uniform rate from a material supply hopper, coatings ranging from 1/32 to 1/4 in. in thickness may be deposited on a sandblasted surface. One type of spray gun now available for this type of work has a capacity of about 20 lb. of polyethylene per hour. Inasmuch as a considerable amount of the material is burned away during the spray application, the process is somewhat costly, although serviceable liners may be produced by this process.

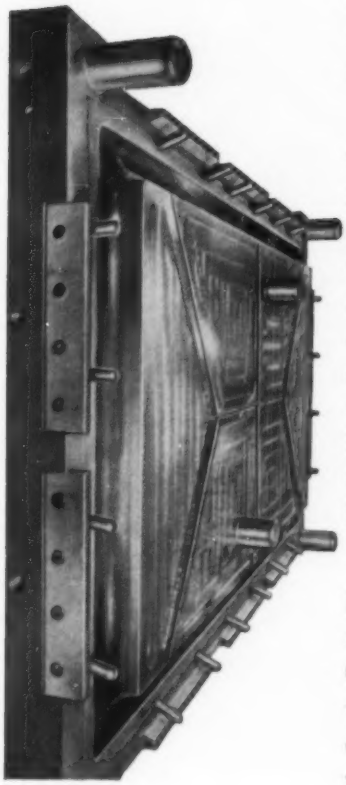
Kel-F Coatings

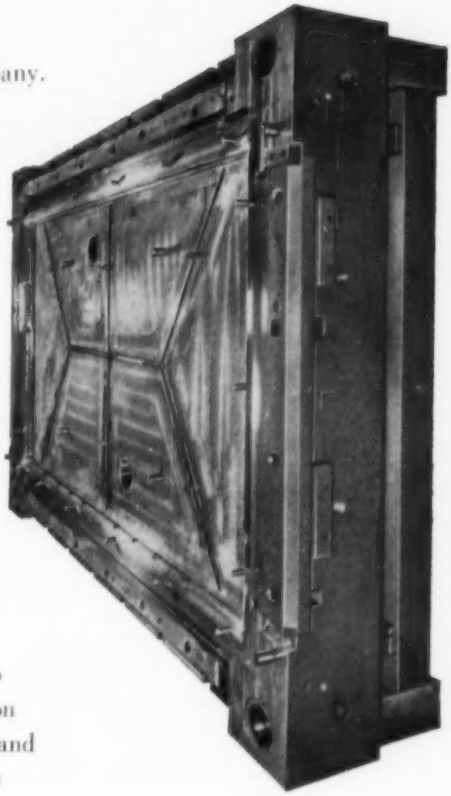
Kel-F fluorocarbon polymer dispersions, available from M. W. Kellogg Co., can also be applied as cor-

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L·O·F Glass Fibers' exclusive Garanized ® roving imparts great flexural and tensile strength to reinforced plastics. It bonds strongly and uniformly to polyester molding resin, both chemically and mechanically. Such plastics, reinforced with Garan roving, are stronger and have higher wet-strength retention. For numerous applications with epoxy, silicone, polyester resins, Vitron® VR-12 Roving is finding wide use among molders.

For technical counsel on how Garan Roving can improve your product, contact our nearest sales office, or write: L·O·F Glass Fibers Company, Dept. 15-125, 1810 Madison Ave., Toledo 1, Ohio.

LOF GLASS FIBERS Garan ROVING

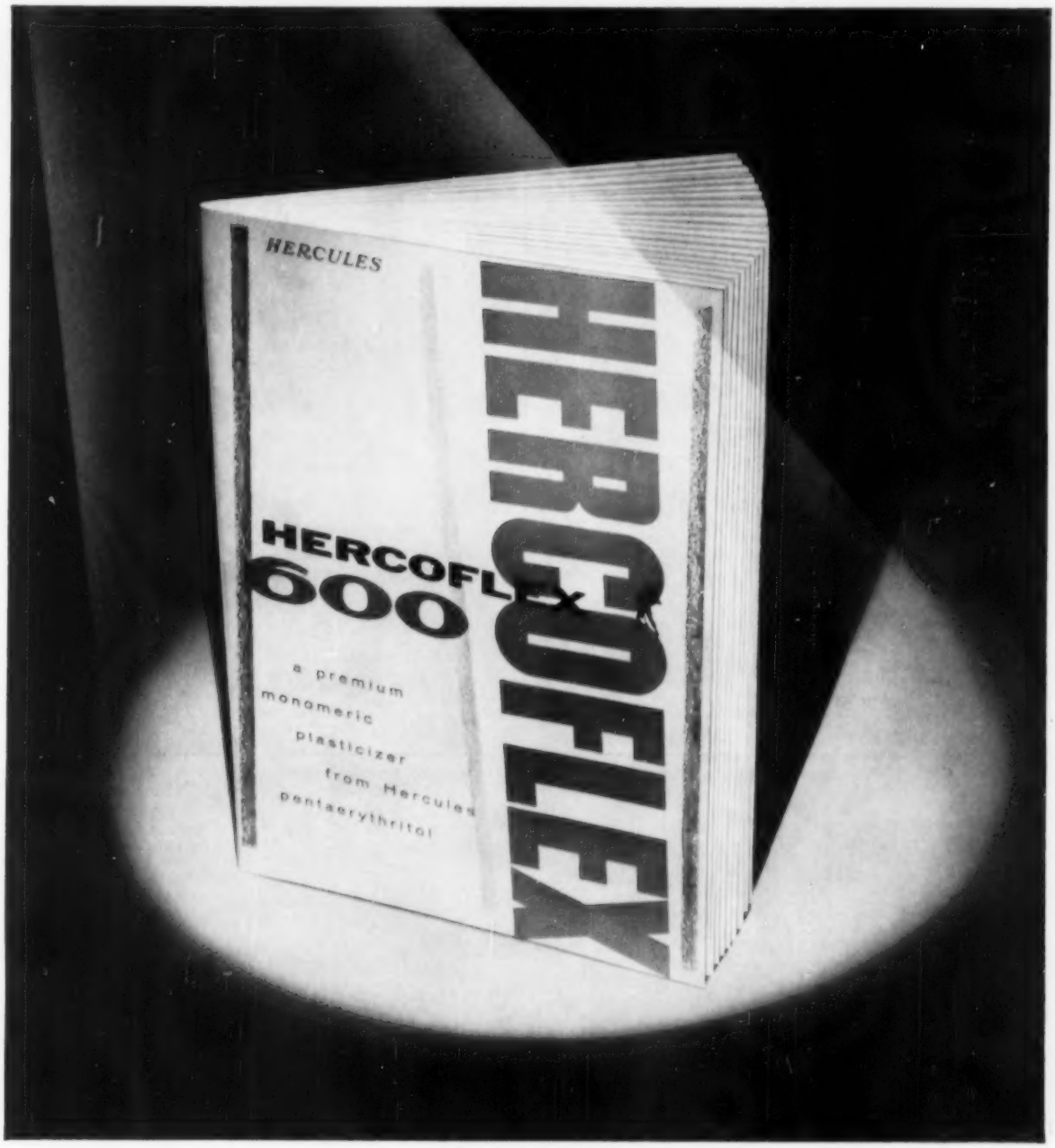
L·O·F GLASS FIBERS COMPANY
TOLEDO 1, OHIO

rosion-resistant linings to shipping containers, tank cars, trailer tanks, and other structures. The dispersions are supplied in two major types—a low-viscosity type used for spray application, and a high-viscosity dispersion for spread, flow, and dip application. Both contain 40% solids. For corrosion protection, a minimum thickness of 0.010 in. (10 mils) is recommended for the finished coating. The tough coatings can be applied to many metallic surfaces as well as to certain non-metallic surfaces.

The Kel-F plastic dispersions consist of finely divided particles of the material suspended in a volatile organic liquid. In addition, low molecular weight waxes are included in the general-purpose spray formulation. Following application, the material is baked for ½ hr. at 480° F. or ¼ to ½ hr. at 520° F. (for a 2- to 2.5-mil coating). Then, air cooling or quenching in water is used between successive applications and baking to build up the final thickness of the coating. Using this procedure, a 10-mil thickness can be built up in five coats for highly corrosive conditions. For extremely severe conditions, the thickness of the coating may be increased to 15 or 20 mils.

The Future

Plastics linings and coatings have thus brought new standards of light weight, corrosion resistance, convenience of installation, and economy to the design of various types of shipping containers and processing and storage tanks for a wide range of food products, pharmaceuticals, industrial chemicals, and other items. It would be difficult indeed to estimate how many millions of dollars are being saved each year through the use of plastics linings which replace heavier, more costly containers or eliminate the need for specialized processing or storage equipment involving expensive, hard-to-fabricate metal alloys and other non-plastic materials. As industry becomes increasingly aware of what may be accomplished along these lines with properly specified plastics, and as material producers and fabricators open up new application horizons, this field appears certain to create vast new market opportunities for the plastics industry.—End



IF YOU WANT FLEXIBILITY AT HIGH AND LOW TEMPERATURES —as in vinyl coated fabrics—you should know more about this new plasticizer. See pages 2 and 3 specifically for detailed technical data. If you don't already have a copy of this book, call your local Hercules district office, or write:

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Styled for Strength

(*From page 107*)

of gold-metallized butyrate sheet and cemented into the lid emphasize the luxurious decorative effect. A mat finish gives a smooth, satiny appearance to the interior of the box.

The inside layer of the base of the box and, on some models, the inside layer of the lid, are contour formed to provide a snug fit for the various sizes and shapes of tableware. Because both inside and outside layers are of formed vinyl sheet, the boxes will resist kitchen acids, greases, and stains; they can be cleaned with soap and water; they are exceptionally long wearing; they are lightweight for economical shipping; and they are more compact in size and more convenient to use than the conventional wooden chests which have heretofore dominated the field.

Five different boxes, ranging in size from a container for a six-piece steak knife set to one for a 48-piece table service set, will be available for the Christmas buying season.

Forming Process

Pressure forming of the vinyl sheets, which are either 20 or 30 gage, is done in 2-cavity molds, each designed to produce one outside layer and one inside section (three of the five boxes have the same outside dimensions; the remaining two are of another size). According to Plaxall, a continuous forming production process devised for the job is capable of turning out the pieces at the rate of eight a minute.

After forming, a sheet of 100-pt. paperboard coated with cement is inserted between the two layers of vinyl sheet. The two sheets are then electronically welded together around their periphery to make a single, sturdy unit.

To attach the tradename medallion, which has been pressure formed separately, to the lid of the case, an oval-shaped section is first cut out of the center of the top layer. Adhesive is used to bond the medallion in place. A ridge formed around the periphery of the medallion and a ridge formed around the oval cutout section of the lid nest together to insure exact positioning of the medallion.

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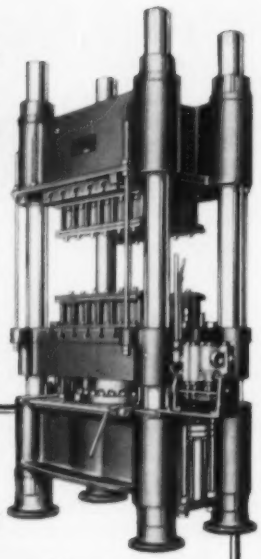
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electronically welding a steel pin between a set of flanges extending out from the vinyl sheets that form both the base and the lid of the box. Closure at the front of the case is effected by a matching button-and-socket arrangement—also formed into the piece. To facilitate opening the case, extending flanges which serve as a convenient grip are die cut out of the sheet at the front of the cover and base.

Formed into each corner of the outside vinyl layer of the base is a small cylindrical foot.

Decorative Finish

As a final decorative touch, gold roll leaf stamping is used to repeat the brand trademark on the inside of the lid and a matching gold cord running from lid to base is used to retain the lid at the proper angle when the box is opened for display.

In some of the boxes, as a means of keeping the various tableware pieces in their proper recesses and as protection for the sharp points of the knives and forks, a thin strip of transparent rigid vinyl is electronically welded either across the top or the bottom of the face of the contoured inside layer.

While the formed vinyl boxes have been initially adopted for the cutlery field, the manufacturers feel that such lightweight, durable packages would be equally ideal for jewelry, cosmetics, housewares, delicate electronics or medical instruments, photographic equipment, and drug supplies. They can be made of transparent material or in a wide range of opaque colors and can be formed to accommodate an almost unlimited variety of shapes. Plaxall is currently even experimenting with the idea of flocking the inside layer of the box (in accordance with the traditional concept of luxury packaging) and then forming it to shape. According to the manufacturer, the price of the formed vinyl case falls in between that of wooden chests and leatherette-covered boxes.

CREDITS: Boxes are styled by George Nelson Assoc., New York, N. Y., and are formed for Chas. D. Briddell by Plaxall, Inc., Long Island City, N. Y. Vinyl sheet based on Geon resin from B. F. Goodrich Chemical Co. is supplied by Nixon Nitration Works, Nixon, N. J. Metallized butyrate sheet for medallion supplied by Coating Products, Inc., Englewood, N. J., using butyrate from Eastman Chemical Products, Inc. Transparent vinyl sheet for protective strip is supplied by Bakelite Co.

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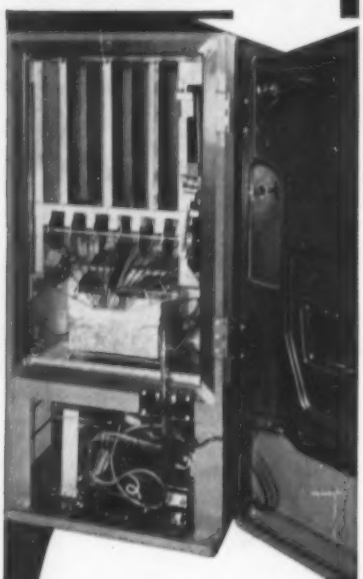
SAVINGS: SHORE-CALNAVAR METAL PRODUCTS CO. reports only 2½ hours needed to produce the tool which was used for polishing 26,000 parts. This was a saving of 80% over conventional type tooling.

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Plastics Structures

(*From* pp. 92-93)

type resin in its early stages and a fully-set resin after other components of the adhesive have been set. Of the other four bonds, two of them have a pot life of ½ hr. and develop working strength in 4 hours. The other two have a pot life of 8 hr. but full strength is not developed until 4 to 7 days after assembly.

One of each of the slow and fast acting resins has a consistency of heavy syrup and can be applied as a glue line and good bond obtained with minimum pressure. The other of each of the slow and fast reacting resins has the consistency of a putty and can be applied as calking, to reinforce corners, and to fill voids.

All bonds are impervious to moisture, are fungus-proof, and some of the adhesives are available in nonflammable form.

Properties

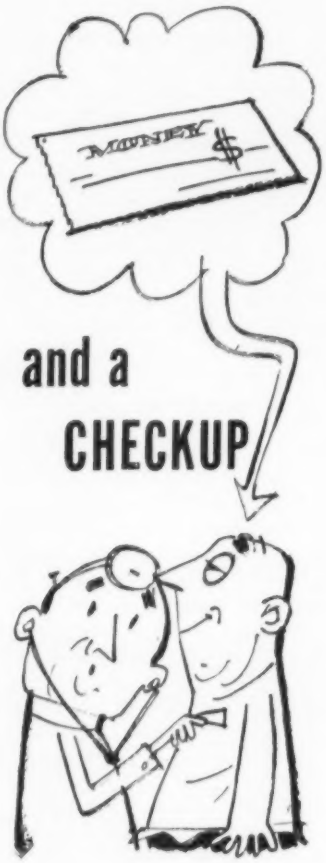
A study of the physical and mechanical properties of Hasko-Struct panels shows, for example, that a 1-in. panel having 0.032-in. faces weighs 0.73 lb./sq. ft. and has a maximum bending moment of 406 in.-lb./in. width. The thermal conductivity in B.t.u. / sq. ft. / hr. / ° F. of temperature difference is 0.24 for a 1-in. panel. Corresponding figures for similar 3- and 6-in. panels—0.08 and 0.04 respectively—indicate the excellent thermal insulating properties of the sandwich panels.

In strength properties, it is stated that a 1-in. panel having 0.032-in. faces supported as a simple beam with a 72-in. span has an ultimate uniformly distributed load of 90 lb./sq. foot. For a 2-in. panel similarly supported, the corresponding load is 180 lb./sq. foot. A 6-in. panel has an ultimate load capacity of 540 lb./sq. ft. for a 72-in. span.

Stiffness and deflection properties of the panel indicate that, for example, the maximum deflection of a 1-in. panel with 0.032-in. faces supported as a simple beam with a uniform load of 10 lb./sq. ft. for a 24-in. span is 0.0113 inch. Similarly, the corresponding deflection for a 50-lb./sq. ft. load is 0.0565 inch.

In impact tests on a 1⅝ in. thick panel backed up with a cement floor, using a steel sphere measuring 3 in. in diameter, no crazing or fracture

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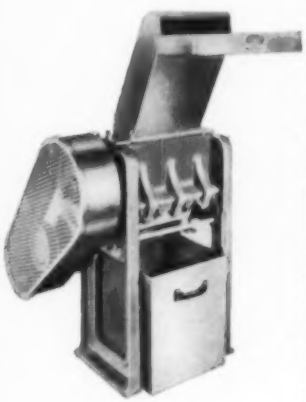


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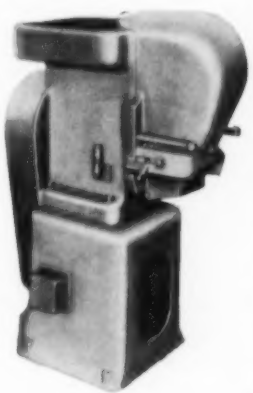
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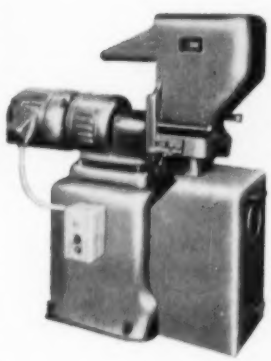
Simple, rugged and highly efficient. Has capacity of 200 lbs. per hour. 3 H.P. Motor with double V belt and Meehanite flywheel. Features high grade roller bearings with positive seal. Four cutting blades placed on a bias permit efficient cutting of thin strips in Vinyl, Saran, etc. Standard screen with ¼" openings (other screen sizes on request). Hopper opening 13¼" x 4½". Floor space required 32" x 44"; net weight with motor (approx.) 800 lbs.

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occurred on panels having 0.060-in. faces up to a maximum of 93 ft.-lb., which produced an indentation of 0.20 inch. On panels having 0.030-in. faces, a similar impact produced a 0.29-in. indentation accompanied by slight crazing but no fracture.

In tests of moisture effect, a box was made using various types of joints, incorporating Hasko-Mold shapes and Hasko-Bond as the assembly medium. A lid was placed over the box and the joints were exposed to 130° F. at 100% R. H. for 3 months without perceptible effects on either the bonds or the panels.

End Uses

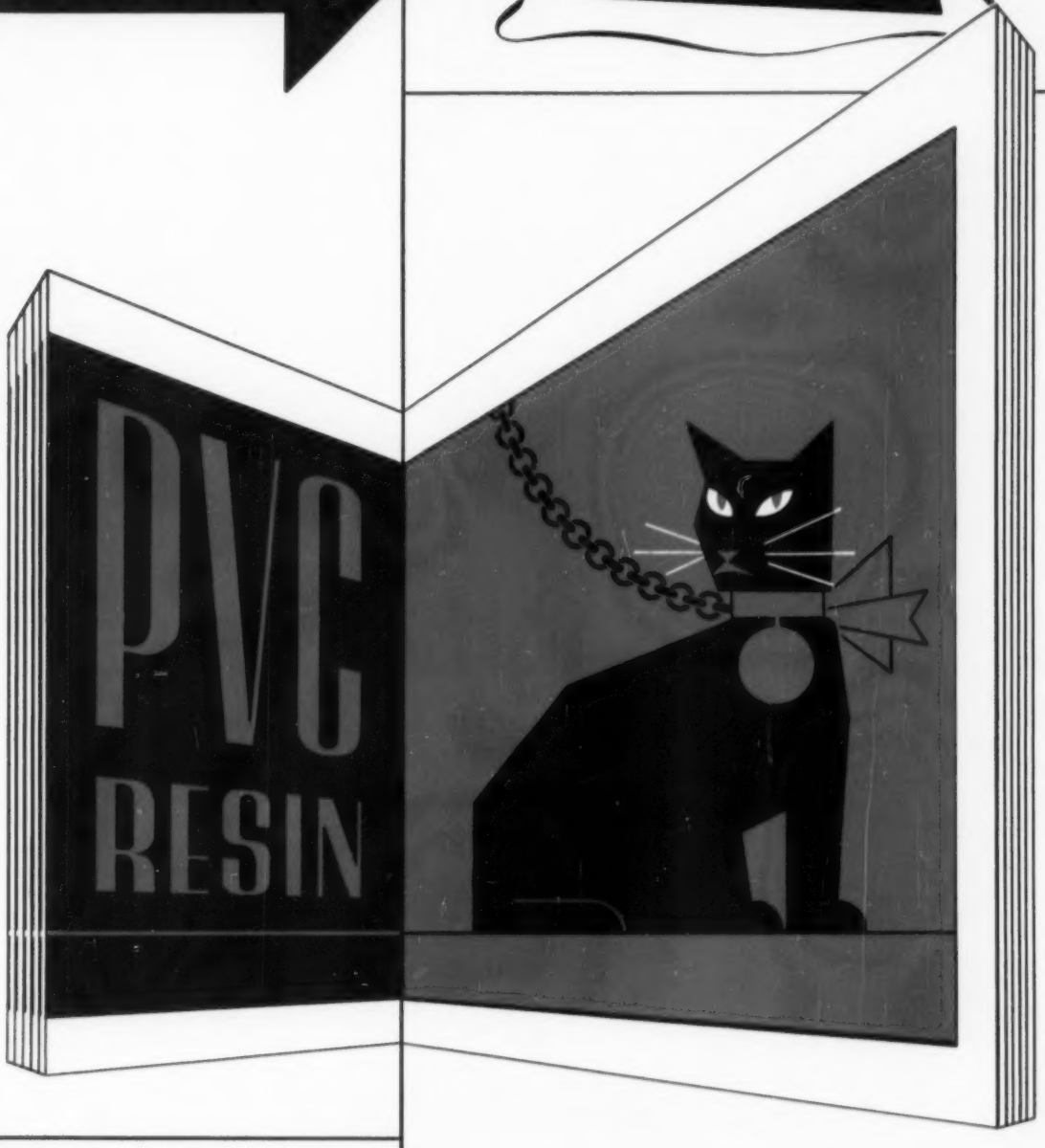
Typical end applications of Hasko-Struct include insulated trucks, trailers, and railroad cars, refrigerators, coolers, curtain-wall panels, shipping containers, partitions, signboards, theater sets, and air-conditioned rooms. In these and other uses to which the panels lend themselves, their structural strength, combined with light weight, makes possible important savings in materials and handling labor hours. In addition, their low thermal conductivity and constant insulating value insure long service life.

One recent project which indicates the adaptability of this type of construction is a sample refrigerated truck body built by National Light Metals Co., Caro, Mich., for The Dow Chemical Co. This unit has magnesium exterior surfaces, while all interior surfaces, including side panels, roof, end panels, and doors are of polyester-impregnated fibrous glass bonded to 3-in. Styrofoam, plus polyester-glass molded door jambs and channels in 0.060-in. thickness. The inner panels are secured to the walls of the body by means of comb-like metal clips, precoated, with adhesive, which upon application of pressure, "bite" into the expanded styrene core of the sandwich to form a secure bond which also maintains excellent insulating efficiency.

With plastics moving increasingly into larger primary structures where such properties as light weight, integral color, corrosion resistance, and ease of fabrication are important, the new Hasko-Struct panels are certain to excite considerable interest among designers, manufacturers, architects, and others who must keep abreast of the latest developments in materials.—END

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Plastics Patches

(*From pp.* 98-100)

Products, Inc., Chicago, Ill.; Fibreglass-Evercoat Co., Cincinnati, Ohio; Fybrglas Industries Div. of Schramm Fiberglass Products, Inc., Chicago, Ill.; and Multiplastics Div. of Kurd Enterprises, Inc., Chicago, Ill. Each of these manufacturers make available kits in a wide range of sizes to meet different requirements—from minor "do-it-yourself" repair work to large, complicated body repair projects. Various methods of packaging are also used. Bonded Products, for example, makes use of a "Tube-in-Tube" construction (one collapsible tube within another) which keeps the epoxy resin and the activator separated. When applying the resin to the fibrous glass mat, the tip of the tube is broken off, permitting the resin and activator to be squeezed out together.

Some of the major suppliers of "plastic solders" based on epoxy resins and finely divided steel, aluminum, or other metals include Kish Industries, Inc., Lansing, Mich.; National Engineering Products, Inc., Washington, D. C.; Destiny Products Co., Detroit, Mich.; Chemical Development Corp., Danvers, Mass.; and Bonded Products, Inc., Chicago, Ill. American Resinous Chemicals Corp., Peabody, Mass., produces a compound containing resin and metal in a high viscosity paste form which cures to a metallic solid at room temperature. A cold solder that may be used for mending pots and pans, repairing fixtures, etc., is also put out by this company. Plastic solders developed by the Chemical Div. of General Mills, Inc., Kankakee, Ill., are based on specially tailored blends of polyamide and epoxy resins, combined with aluminum powder.

With continued developments in materials and further study of the repair problems encountered in different fields, various types of plastic patching compounds and combinations appear certain to enjoy steadily growing acceptance. As such, they mark a promising new outlet for several types of plastics resins heretofore used primarily in laminating and adhesive work, as well as heralding a new concept in economical and efficient repair of many types of products—from downspouts to sports cars.—End



plastic cases spark sales for battery makers

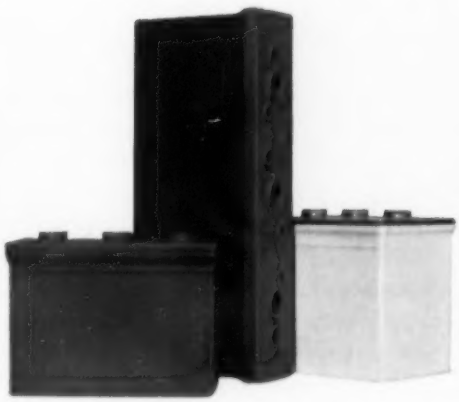
Several years ago the Air Force asked us, "Can you build battery cases for jet planes? Can you make them tough . . . able to stand sub-zero cold and high engine heat? Can you make them lightweight, dimensionally stable and corrosion resistant? And can you produce them in large quantities?"

With the aid of our research and development team, we were able to do the job.

Then, a company which manufactures replacement auto batteries told us, "We want everything the Air Force got and something more—a feature to make our cases sell faster." So, we went to work on this problem, and came up with color—molded-in color.

Today, bright, colored plastic battery cases are a major factor in the replacement battery business—bringing new sales to manufacturers and dealers and new value to their customers.

Call on this research and development team at General American. They may be able to help you in your business, too.



Plastic battery cases molded by the Plastics Division of General American Transportation Corporation.

PLASTICS DIVISION

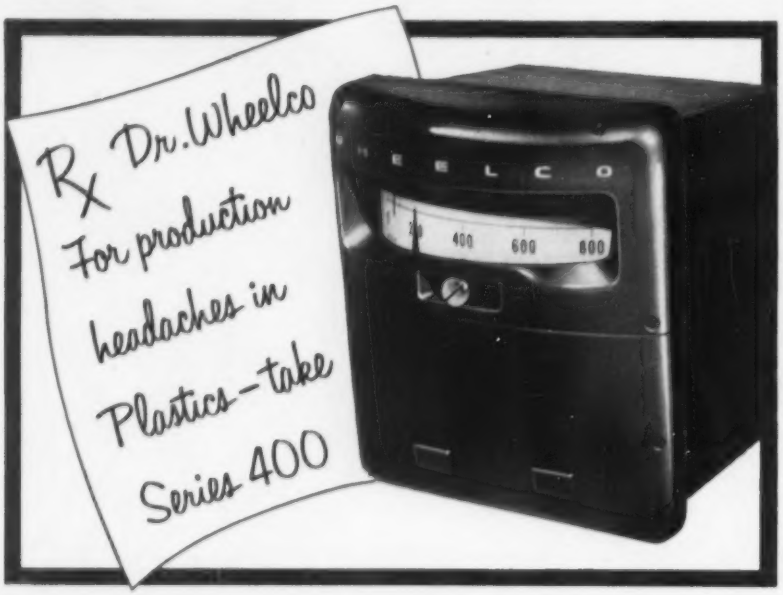
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Plastics Aerosols

(*From page 97*)

strength of the melamine housing provides considerably more flexibility—an important factor when designing for the "beauty conscious" cosmetics market.

In addition, the entire assembly shows excellent dimensional stability, offers good heat resistance, and will not pick up odors.

Tests have also shown that there is little diffusion or transfer of product through the container walls under pressure. Reportedly, in six months' study under elevated temperatures and other appropriate test conditions, the Angelique samples showed "no discernible loss."

The major components of the aerosol package are the melamine container and the melamine lid which is screwed tightly onto the container with a special tool. A Buna rubber gasket under the lid and a pressure shoulder molded around the periphery of the lid help contribute to the effectiveness of the seal.

In the valve assembly, the only non-plastic component is a stainless steel spring activating the collet. The other parts include a polyethylene dip tube, a melamine valve housing (precision molded to produce a valve that seats perfectly flat). Buna rubber gaskets, a nylon valve stem, and a white polyethylene activator button. Molded-in internal threads in the melamine valve housing enable it to be screwed onto the lid. A white polyethylene overcap which fits over the top of the container completes the assembly.

According to the designers of the aerosol, the selection of melamine, nylon, and polyethylene for the various valve components reduced the possibility of swelling or warpage taking place and causing the valve to fail.

Although only recently introduced to the market, the melamine aerosol is already the object of close scrutiny by manufacturers who see in it a combination of styling and protection ideally suited to the packaging of not only beauty products and personal items, but drugs and pharmaceuticals as well.

CREDITS: Containers molded by Colts Mfg. Co., Hartford, Conn., using melamine compound 1077 supplied by American Cyanamid Co.; valves by Nanuet Valve Co., Nanuet, N. Y.

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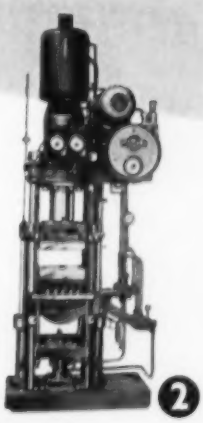
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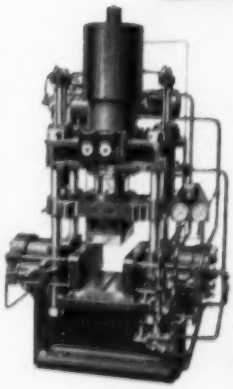
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Formed Sheet

(*From pp.* 108-111)

than 5½ in., with an over-all depth of ⅜ inch. This plug is equipped with a handle for easy removal. Another protective cover of the same material is a pan-shaped affair about 11 in. in diameter which is used to protect the valve assembly of the T-34 turbo-prop engine. It prevents dust, etc., from causing damage during engine assembly, transfer of the engine to and from the test house, and during the teardown of the engine.

Figure 12, p. 111, shows a formed threaded cap device which is used to protect the threads of a lathe spindle during shipment.

Conveyor Trays

Figure 13 shows a dual conveyor device with trays formed from styrene copolymer sheet riveted in place on a metal frame. Multiples of this unit are used by the General Electric Co. on a conveyor in one of their assembly plants.

Sliver Pan

A component used in a large textile machine made by Whitin Machine Co. is known as a sliver pan and its purpose is to guide and channel the textile fibers. It was originally a chrome plated metal casting and is now being formed from copolymer sheet (Fig. 14). The company states that the formed sheet pan is less expensive and has a decidedly longer wearing life than the metal casting sliver pan which it replaced.

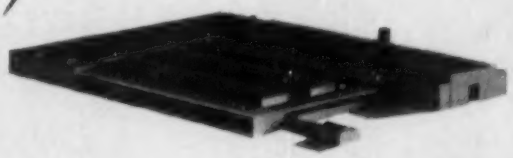
The foregoing examples of the use of formed styrene copolymer sheet in industrial applications clearly indicate two things. First, that the material has the properties and manufacturing simplicity to replace and/or complement the use of stamped metal parts; second, that the use of this material for industrial applications has only begun. Careful study and investigation will undoubtedly uncover many similar applications which can be converted over to styrene copolymer sheet at marked savings in tooling and piece price, as well as increased life and efficiency.

CREDITS: Materials—Boltaron, Bolta Products, Div. General Tire & Rubber Co.; Royalite, U. S. Rubber Co.

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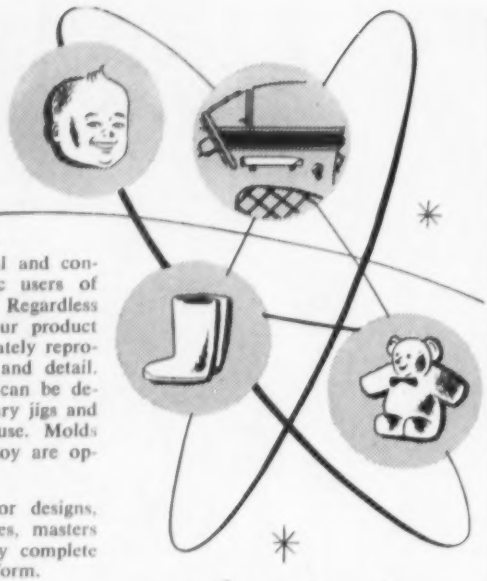
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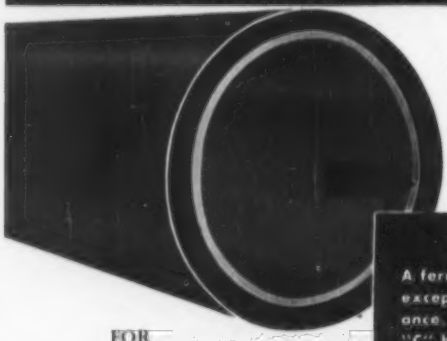
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Vinyl + Reinforced

(*From pp. 115-124*)

heated electrically or by circulation of hot oil or hot water.

When the temperature of the mold is maintained at 150° F., it exerts a cooling effect on the vinyl and, therefore, prevents the vinyl from being damaged by the heat generated by the exotherm.

Metal Fasteners

Mountings for latches and hinges can be incorporated into the laminate construction during molding.

Metal bosses, tapped or untapped, are first brazed or welded to a rectangular sheet of 22-gage perforated steel (Fig. 16). This assembly is then placed in the mold with the boss position in a recess in the force. A glass mat, carefully cut to size to prevent mark-off on the vinyl, is placed between the perforated metal and the mold in such a manner that the perforated metal becomes imbedded in the polyester-glass laminate during molding, leaving the metal boss protruding from the part.

On covers for the IBM Sorter machine, Unistrut members are bonded to the covers using polyamide-modified epoxy adhesives. Unistrut provides the stiffening for the covers and is also used for attaching fasteners. The bonding surfaces of the Unistruts and covers are sandblasted, then coated by flow-gun with epoxy adhesives. Figure 17 shows the coated Unistruts positioned on the cementing fixture. The Unistruts are placed on aluminum bars that are crowned to the cover configuration or profile. These aluminum bars are heated to 200° F. by means of strip heaters. The cover is placed over the Unistrut and light pressure applied by means of De-Staco clamps (see Fig. 18). After 10 min. in this position, the cover may be unclamped and removed from the fixture, at which time the bond has reached 75% of its ultimate strength. Complete cure and ultimate bond strength occur within 48 hours.

The various mounting brackets are fastened to the bonded Unistrut by means of standard Unistrut fittings (see Figs. 19 and 20). The framework of the machine is, in turn, tied to the covers through these brackets. The Unistrut cover assembly in actual service is stressed

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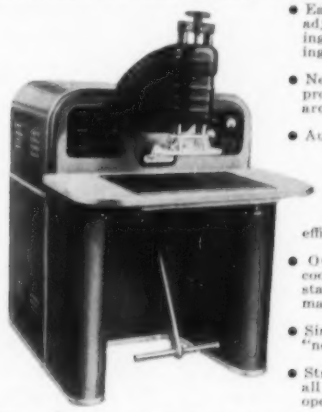
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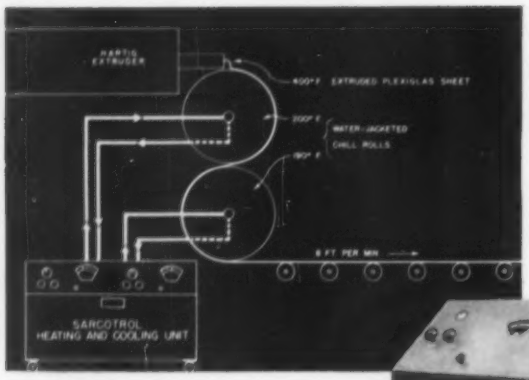
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In developing a technique for use by fabricators in extruding *Plexiglas* sheet 36" to 48" wide, Rohm & Haas research engineers faced the critical problem of cooling this extra-wide sheet as it was extruded.

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How could even temperatures be maintained across the *entire* face of the water-jacketed chill rolls? This was the heart of the problem.

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in such a manner as to apply a combination of peel and shear force to the bonded joints. For this reason the epoxy adhesive is made flexible by the addition of polyamide resin. A typical bonding formulation is as follows:

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Bakelite ERL 3794	100
Bakelite ERL 2807	10
Polyamide 115	50
Titanox TG	40

Control tests are made on 2-in. lengths of Unistrut, bonded to 6- by 1-in. strips of molded laminate cover material. These are tested for tensile shear on a Tinius-Olsen Super L testing machine. The average failure occurs at 400 p.s.i. The layer of adhesive usually remains adhered to the steel, but the face of the reinforced plastic molding is generally pulled apart. Methods for increasing the adhesive strength of the reinforced plastic facing are currently being sought. Studies, to date, indicate that an improvement in the surface strength might be expected by using a glass fabric or unidirectional mat molded to the inner surface of the covers.

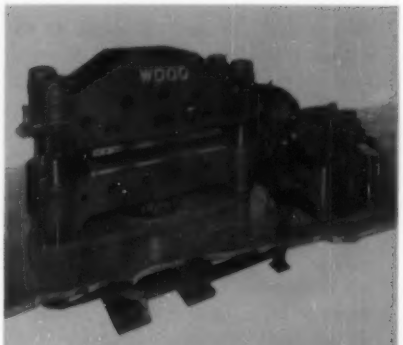
Finishing

The cover is placed over a wooden fixture and clamped to the saw table by an air cylinder (see Fig. 21), preparatory to trimming. The saw blade is then pulled through the cover. This arrangement provides the dimensional accuracy required. For limited production, the covers are rotated manually 90 degrees following each cut. An automatic rotating setup is envisioned for full-scale production. With the present manual method, 30 covers are trimmed in 1 hour.

A Hendrick Panel Saw is well adapted to this type of operation. Cutting is done with a 10-in., radially-carbide-tipped, circular saw (see Fig. 22). The saw has 72 teeth with $\frac{3}{32}$-in. kerf and operates at 3450 r.p.m. Feeding speeds of 20 to 30 linear ft./min. give the cleanest cuts.

Blades are resharpened after every 1000 linear ft. of trim. Trimmed edges are lightly sanded to remove loose fibers. Bonded abrasive cut-off wheels have been evaluated, but they tend to load with the thermoplastic vinyl.

Switch openings and access doors are routed into the covers with a

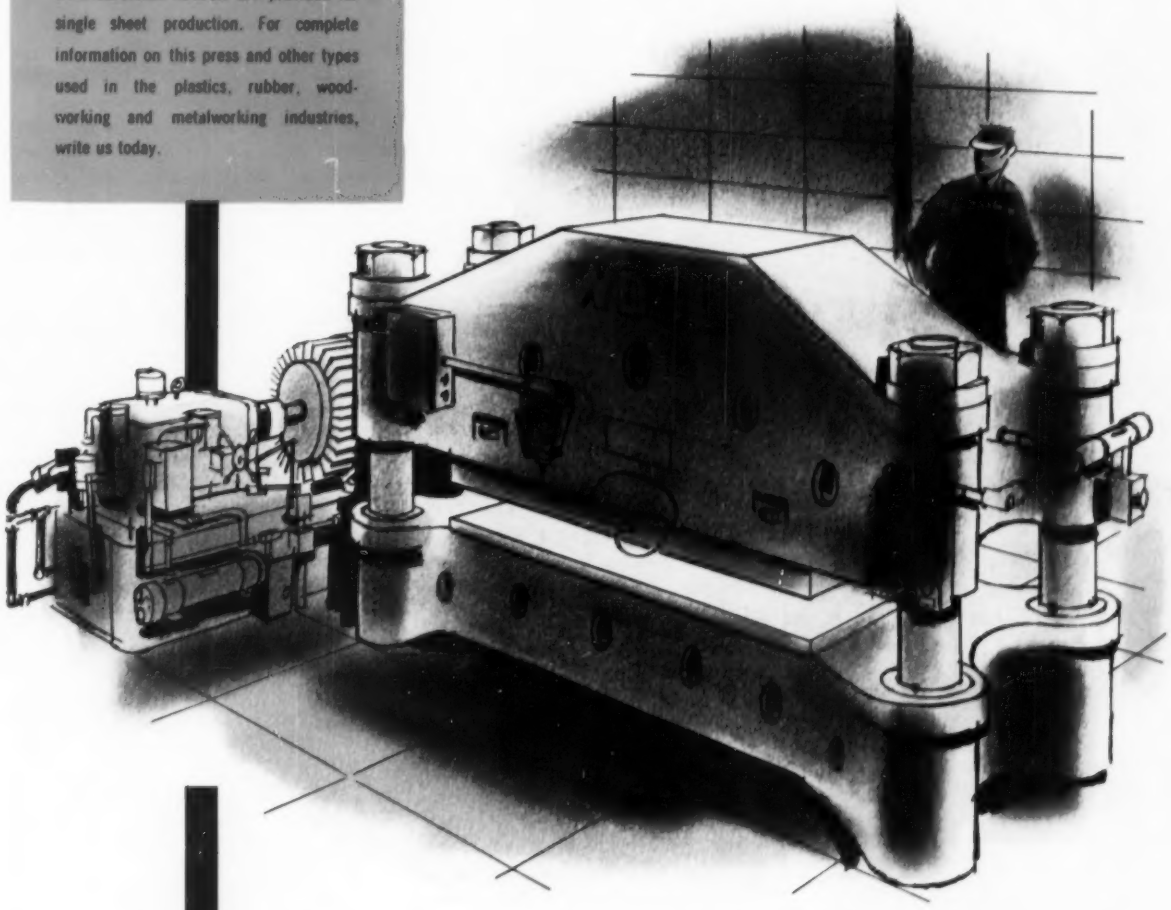


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½-in. dia., carbide-tipped router bit at 20,000 r.p.m. (see Fig. 23). The work can be fed at a speed of 20 in./minute. In full-scale production, these openings will be punched in preference to routing. Experiments in punching show that the punch should enter from the vinyl side of the covers.

Plastics Tools

In the course of the vinyl-to-reinforced plastic laminate cover project, practically all available materials for making molds have been evaluated. Molds made of plastic have been used to advantage for producing models, prototypes, and short runs up to 50 parts. Continued experimentation may lead to constructions that produce fairly long runs.

A major difficulty in this respect has been the breakdown of the shear edge of the plastic molds. Much work remains to be done on the job of incorporating reinforcing metal inserts at these shear areas. Most of the plastic molds evaluated to date have been of laminated construction. These are built up over a pattern by laying down a surface coat, or gel coat, of epoxy resins; next, a laminate is built up of glass fabric and epoxy to a thickness of 3/16 to ¼ inch. The laminate, in turn, is supported with an epoxy casting resin. These laminated molds have been moderately successful, but are subject to surface failures due to voids between the surface coat and the laminate. Because of the low heat conductivity of the material used in the mold construction, heating molds raises another problem.

A new method of using sand-filled epoxy, tamped into place over a 1/16 to ⅛ in. thick gel coat, appears to eliminate the surface coat type of failure. Tubing for circulating heating fluid can also be more readily incorporated in this type of construction.

The success or failure of a cast Kirksite mold seems to depend largely upon the skill and experience of the foundry doing the casting. Limited experience in this area calls for additional experiments to be made.

The embossed vinyl provides an integral finish for the outside of covers, eliminating any further need for surface finishing.

The quality of the inside of covers, which are not exposed, is of minor importance. For this reason, the molds do not require finishing to the usual surface quality, consequently lowering tool cost, regardless of the particular type of tooling material used.

Precision cast aluminum, machined at the pinch-off areas only, has been evaluated on a series of six molds. Results have varied from good to bad. Here again, the quality of the mold depends on the skill and experience of the foundry. Problems with metal molds thus far have been: 1) porosity of the cavity radii and 2) lack of strength due to the fact that wall sections in the casting must be limited to ⅝ inch. It is felt that the proper strength of aluminum molds can be obtained with ribbing and fillets. Rejections of castings and cost of rework has been reflected in progressively higher prices for this type of mold.

Sand-cast aluminum was used successfully on the IBM 086 Sorter machine cover molds. The molds were cast to a uniform 1-in. wall section with adequate ribbing. Molding surfaces were rough machined over-all, and were finished by scraping, sanding, and grinding. Final cost was lower than for precision cast aluminum molds of comparable size without machining. Porosity, uncovered by machining, was filled with epoxy putty containing aluminum powder. For runs up to 2000 parts, this type of mold is most economical and dependable. For runs of more than 2000 parts, steel molds are preferred. These molds are constructed of SAE #1045 steel and are chrome-plated and flame-hardened at the shear edges.

CREDITS: ERL 3794 epoxy resin by Bakelite Co., New York, N. Y.; DeStaco clamps by Detroit Stamping Co., Detroit, Mich.; Fiberglas mats and roving by Owens-Corning Fiberglas Corp., New York, N. Y.; Hendrick panel saw by Hendrick Mfg. Corp., Marblehead, Mass.; Hetron polyester resin by Hooker Electrochemical Co., Niagara Falls, N. Y.; Knitkote knitted cotton backing by Wellington Sears Co., Inc., New York, N. Y.; Laminac polyester resins by American Cyanamid Co., New York, N. Y.; Luperco peroxide catalysts by Lucidol Div., Wallace & Tiernan, Inc., Buffalo, N. Y.; Radialloy saw blades by Radial Cutter Mfg. Corp., Elizabeth, N. J.; Titanox titanium dioxide by Titanium Pigment Corp., New York, N. Y.; Polyamide 115 by General Mills, Inc., Minneapolis, Minn.; Unistrut channeled structural steel by Unistrut Products Corp., Chicago, Ill.; vinyl overlay sheet by O'Sullivan Rubber Corp., Winchester, Va.



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- The biggest capacity of any granulator with its throat size.
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2 reversible bed knives
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1½ h.p. motor (3 h.p. also available)
55° angle knives for polyethylene and warm materials

DIMENSIONS
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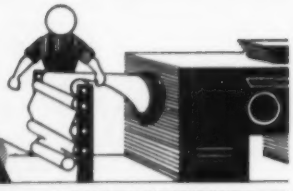
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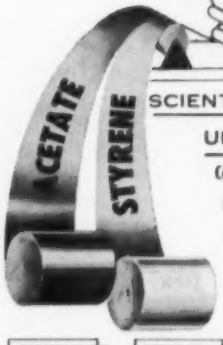
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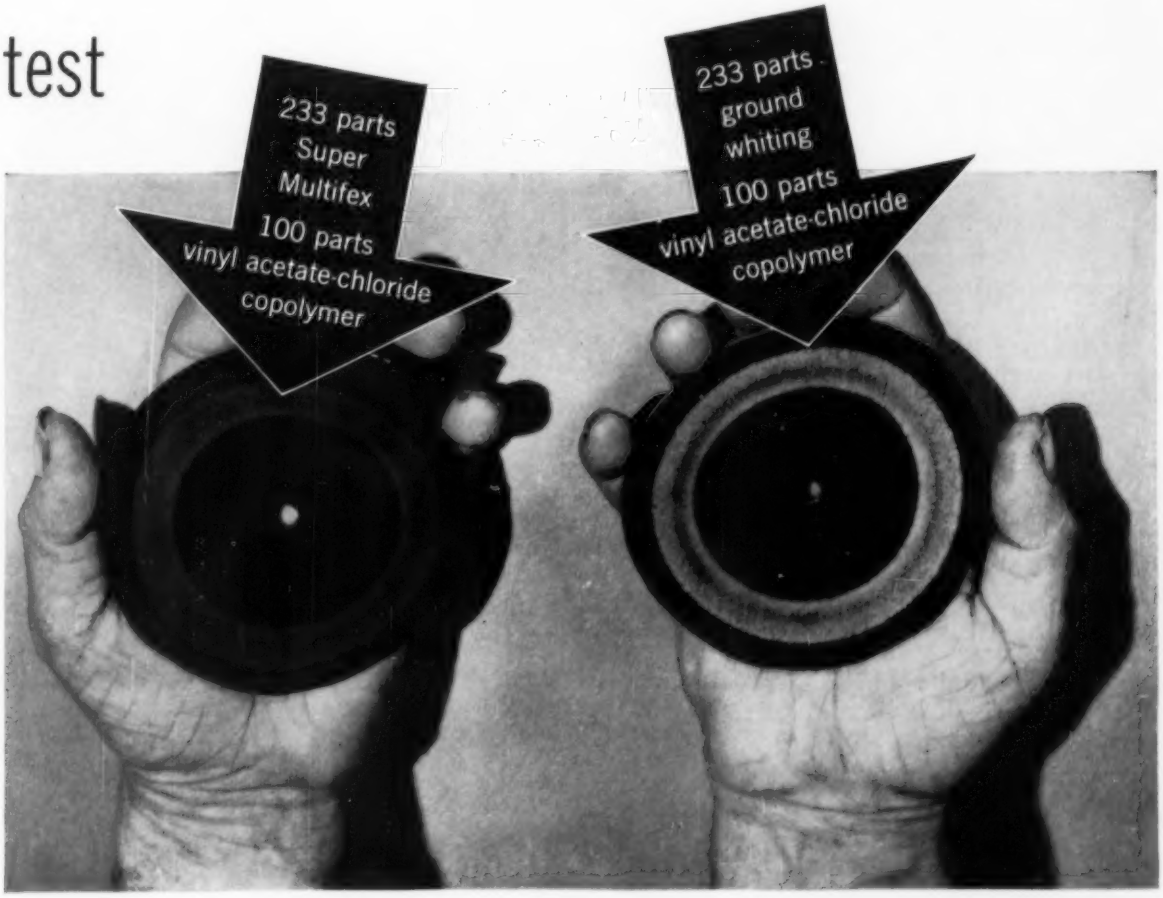
Disk with 70% Super Multifex® loading wins abrasion resistance test

Look at these two vinyl disks, shown after they received identical treatment from a Taber Abraser.

Note how the disk at left—loaded with DIAMOND's SUPER MULTIFEX—has whitened considerably less than the vinyl disk (right) loaded with the same weight of coarser filler. A comparison in the loss of weight due to the abrasion clearly showed that the vinyl compounded with SUPER MULTIFEX was superior in abrasion resistance to the vinyl containing the ground whiting.

Vinyl compounds highly loaded with this ultra-fine particle calcium carbonate show less whitening on bending and scratching. SUPER MULTIFEX has a very uniform particle size —about 0.03 microns—and a double coating with two different agents to aid its dispersion.

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Pressure Vessels

(*From pp. 146-156*)

plastic nature of the liner was evident as it had softened at the elevated temperature and reformed when returned to room temperature.

The study of temperature effects was continued on another commercial cylinder placed in cyclic storage of −65 and 125° F. for 1-week periods, respectively, while pressurized to 2000 p.s.i. with air. No defects developed after 1-week storage at −65° F. Upon removal from 125° F. storage after the second week, a slight parting of the glass fiber strands was noted approximately 1 in. from the pressure connection. The cylinder was retested for volumetric expansion at 3500 p.s.i. and a permanent set of 5.76% was observed. The cylinder was replaced in −65° F. storage for 4 days, when it was removed after a pressure decrease was noted. The cylinder was leak-tested in a water bath with an air pressure of 500 p.s.i. pressure. Leakage was observed through the glass fiber material at the point where strand parting had previously been noted and also at a point 1¼ in. from the opposite end of the cylinder.

Other plastic pressure cylinders have been experimentally developed for the Chemical Corps and some limited results of their performance are available.

Under primary hydrostatic test at 3400 p.s.i., failure of the metal connection-tube insert has been noted on initial designs of these cylinders. More recent prototypes have exhibited markedly improved characteristics in this respect. Generally speaking, it appears from testing of initial models that deficiencies in design rather than material failures are responsible for poor performance. It seemed that the points at which these cylinders failed demonstrated inadequate design consideration regarding plastic material strengths and provision for uniform stress distribution.

The most recent designs of cylindrical plastic pressure vessels have the following performance when tested: 1. Minimum rupture strength was determined as 6000 p.s.i. with porosity failures at 5200 to 5500 p.s.i. on cylinders that were not fatigue-cycled. 2. A cylinder that was fatigue-cycled at 2500 p.s.i. for 2000 cycles showed a rupture strength of 5200 p.s.i., with porosity failure at 4200 p.s.i. after testing at 3500 p.s.i. 3. The cylinders had the following physical characteristics: wall thickness 0.19 to 0.22 in.; weight 3.44 lb. average; volume-weight ratio 57.6 cu. in./lb.; approximately 10% loss of ultimate rupture strength at 160° F.; no effect due to −40° F. storage.



Fig. 11—Rupture of plastic cylinder pressurized to 2000 p.s.i. and placed in 160° F. storage

Low-Pressure Cylinders

Concurrent with the foregoing work on high-pressure vessels, development was undertaken of a low-

pressure plastic cylinder. These low-pressure cylinders were required to meet a minimum rupture pressure of 900 p.s.i., operating pressure of 450 p.s.i., and a fatigue strength of over 2000 cycles at this pressure.

Satisfactory prototype plastic low-pressure cylinders gave test results as follows: 1. Before fatigue-cycling, the cylinders had rupture strengths between 900 and 950 p.s.i., with porosity failures between 750 and 850 p.s.i. 2. The cylinder subjected to fatigue-cycling at 450 p.s.i. for a minimum of 2000 pressure cycles had an ultimate rupture strength of 950 p.s.i. 3. These cylinders had wall thickness 0.080 in.; weight 3.8 lb.; volume-weight ratio of 151.7 cu. in./lb.; approximately 10% loss of ultimate rupture strength at 160° F. and show no effect due to −40° F. storage.

General Conclusions

Certain conclusions are evident regarding fibrous glass-reinforced plastics as a broad class of engineering materials and with specific respect to their use for construction of pressure vessels:

1. Reinforced plastics material can offer distinct advantages in the reduction of weight-to-volume ratios while meeting the other characteristics required of pressure vessels.

2. The material is adaptable to manufacture of shapes and forms of containers to meet unique design and application requirements.

3. The use of a plastic composite offers combined properties of high corrosion resistance, temperature and weather resistance, good dimensional stability, and excellent impact strength. Failure of plastic pressure vessels covered by this report were attributed to over-stressing the liners and incomplete bonding between the resin and liner.

4. Unless carefully controlled, the heterogeneous composition of this material can present problems involving the resin binder and/or the glass reinforcement which adversely affect ultimate characteristics of the finished product.

5. In the present state of development more specific engineering data are needed for reinforced plastics to establish the basis for continuous uniform production of items having physical and structural qualities required for the application for which they are intended.—End

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Cellulose Propionate

PLANS for the further diversification of its Plastics Div.'s line by the inauguration of the first large-scale commercial production of cellulose propionate at its Belvidere, N. J., plant has been announced by Celanese Corp. of America. The material will be marketed under the name Forticel.

Bjorn Andersen, vice president and general manager of the division, states that assured sources of high-quality propionic acid now available for the first time at the company's chemical plant in Pampa, Texas, and of high alpha cellulose at affiliated plants in Canada and Mexico are primarily responsible for the decision to go into commercial production. The field was first explored by Celanese in 1945 with a pilot plant.

According to Mr. Andersen, volume production of Forticel will get under way shortly. Meanwhile, sample quantities of the material are being evaluated by molders in such applications as fountain pens, telephones, appliance housings, football helmets, and other end uses where Forticel established its suitability during pilot operations.

The new material is claimed to have a short molding cycle which in some cases amounts to a 25% increase in production per machine.

Packaging Laboratory

ONLY a year ago, Mylar polyester film was considered to be impractical for packaging purposes because of cost as well as handling difficulties. However, when Du Pont recently opened its new packaging laboratory for a visit by the press, the most startling development noted by this observer was the evolution of this gorgeous material into a practical possibility for scores of packaging applications. A $3 a lb. film such as ½-mil Mylar would seem like a bit of luxury for the packaging industry, that will sharpen its pencils to get a 1/16¢ advantage, but the Du Pont exhibits certainly indicated that a big push will be made to convince packagers of the usefulness of Mylar for their purposes.

Of course, no one expects volume to equal that of polyethylene or cellophane for years to come—if ever—but Mylar's beauty, clarity, and strength furnish an appeal that packaging men find difficult to resist.

The drawbacks to its use as a packaging film are being constantly lessened. Cost, for example, was radically reduced last spring. Furthermore, because of its strength, Mylar can be widely used in very thin sections—with a consequent high yield per pound—and handling on packaging machines presents major problems. But Du Pont hasn't been caught napping on this one. The company is developing machines in its own laboratory for this purpose.

Of particular interest at the press showing was a machine which seals strips of Mylar into tubular form, using benzyl alcohol applied to the edges of the film strips as a solvent cement.

Problems of printing on Mylar are also being studied in the new laboratory.

First uses for Mylar in packaging will be where its clarity and strength are especially valuable as in wrapping textiles and heavy produce, such as apples, root crops, and nuts. Perhaps some day it will even be possible to cook the contents of a Mylar package right in the sack. It seems especially useful for packaging sharp cornered, heavy articles such as hardware. So far, it has proved most effective as a window for cardboard boxes where visibility is important.

Another interesting part of the Du Pont exhibit was a specially built laminating machine which permits reproduction of any laminating conditions which might be encountered in everyday operation. It can be used to combine two flexible webs, such as cellophane and aluminum foil, for a special packaging application, or it may be used to combine a flexible plastic film with a rigid material, such as wood or steel, for an industrial use. It handles either water-emulsion or solvent-solution adhesives, which can be applied by any of the variety of methods actually used in the trade.

Hercules New Polyethylene

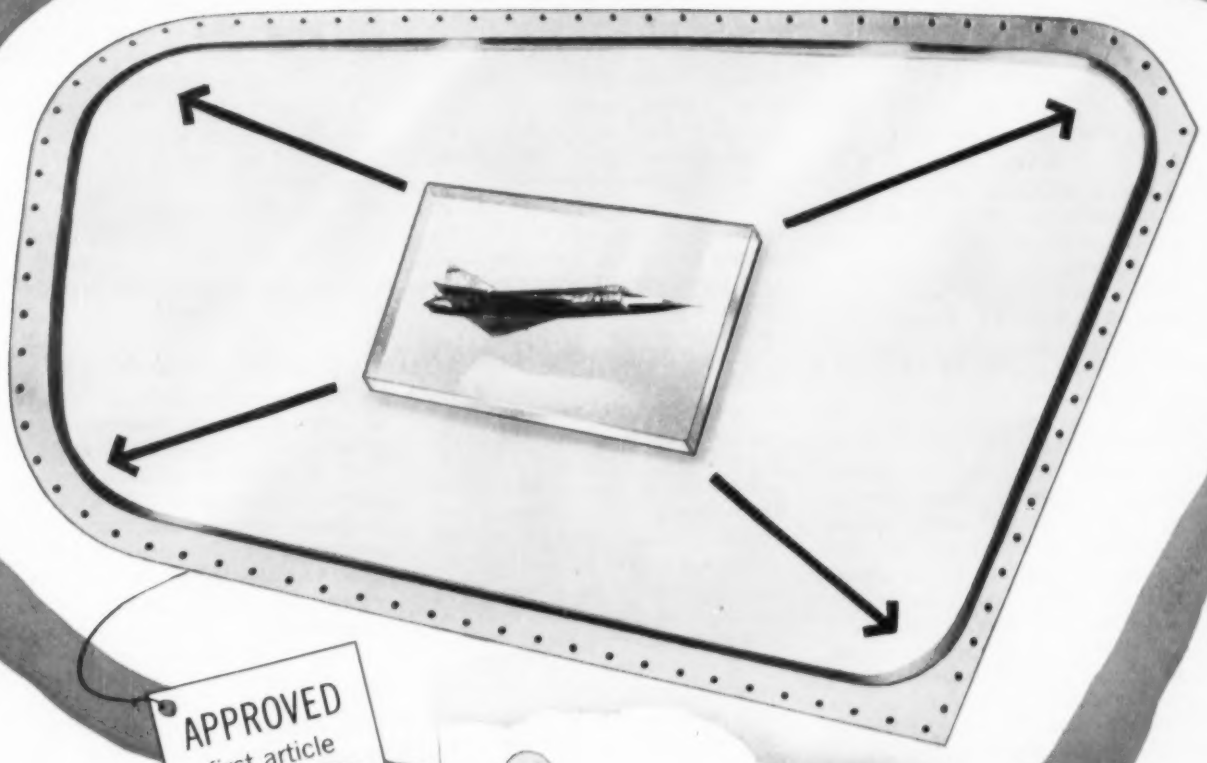
PLANS to enter an entirely new field of chemistry with a new $10 million plant at Parlin, N. J., have been formally announced by Hercules Powder Co., Inc. As mentioned in the article, "Polyethylene Grabs the Spotlight" in the September issue of MODERN PLASTICS, the first product to be produced in this plant will be the new low-pressure polyethylene which Hercules will produce by the Ziegler process. Annual capacity for polyethylene in this plant will be 30 million pounds. Production is scheduled to begin late in 1956, but enough will be available to permit orderly marketing of small tonnages early in 1956.

There are several significant factors in the Hercules announcement. One is that this is the second new field of chemistry into which Hercules has recently entered. The other was the cumene process for production of phenol, acetone, and other chemicals at its Gibbstown, N. J., plant. The production of polyethylene at the Parlin plant is probably only the beginning of an introduction of a complete new line of products that will be produced by the new Ziegler catalytic system. These new catalysts are expected to open up a whole new field of catalytic chemistry particularly adaptable to the petroleum industry. Under its contract with Ziegler, Hercules has the exclusive right to sell a basic component of the Ziegler catalyst in the United States and Canada.

Another important factor in the Hercules announcement is that it will be able to skip the usual pilot plant operation because of a special arrangement with Farbwerke Hoechst, A. G. in Germany. The latter was the first company to start work on the Ziegler process, is well along in its developmental operations, and will exchange research information with Hercules. The Hoechst commercial plant will be

* Reg. U. S. Pat. Off.

Swedlow announces an important advance in aircraft glazing... STRETCHED PLASTICS



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The culmination of a Swedlow-sponsored development program extending over several years, this process involves the molecular rearrangement of acrylic sheeting by mechanical stretching, improving toughness, resistance to solvent and stress crazing, reducing notch sensitivity and resulting in a substantial saving in weight.

Aircraft sighting panels using stretched acrylic (MIL-P-8184) sheeting (48" x 48" x .350") are currently being produced by Swedlow for the new supersonic F-102A all-weather Air Force interceptor now in production at the Convair Division of General Dynamics Corporation.

For information on "Stretched Acrylics" and other plastic glazing materials, contact the Swedlow plant nearest you.

Swedlow PLASTICS CO.

LOS ANGELES, CALIFORNIA • YOUNGSTOWN, OHIO

THE PLASTISCOPE

in production in early 1956 and will furnish polyethylene to Hercules so that the latter will be able to distribute, pending the completion of its own plant at Parlin.

Hercules has as yet made no announcement concerning its source of supply for ethylene, but there are several petroleum refiners in the area, any one of whom could provide facilities to do the job.

Thermoplastic Adhesive in Coil Form

THERMOPLASTIC adhesives have enjoyed a remarkable growth in the last 10 years, but there are still many problems involved in handling them. A new adhesive concept developed jointly by United Shoe Machinery Corp., 140 Federal St., Boston, Mass., and its subsidiary, B. B. Chemical Co., 784 Memorial Dr., Cambridge, Mass., appears to overcome many of the difficulties previously encountered in thermoplastic adhesives, making possible a number of new and desirable cementing characteristics. This engineered system, which takes advantage of the new thermoplastic material characteristics by utilizing a specially designed applying device, is being marketed under the name Thermogrip.

Many presently known thermoplastic adhesives must be heated, applied, allowed to cool, and then reheated and pressed to achieve the final bond. Some of these adhesives are carried in a liquid vehicle such as water or an organic solvent, others are solids. The liquid vehicle is excess baggage—it costs money to mix it with the thermoplastic material, to ship it, and then to get rid of it when the adhesive is applied. When the solids are in cake or bulk form, they frequently cause handling and heating problems.

Glue in Extruded Strips. Thermogrip is extruded in a flexible, continuous cord-like form, ¼ in. in diameter, ready for use. United's specially designed heating units simultaneously heat, melt, and apply the adhesive at the rate demanded by the application. The principle used permits only a few grams of adhesive to be in a molten form in the applying unit at any one time.

Possible to Use Different Thermoplastics. This combination of cement form and handling apparatus achieves many advantages over both liquid-carried thermoplastics and solid hot melts. Chemically, it permits the use in formulating of a greatly extended range of adhesive rubbers, resins, and gums since the short heating interval practically eliminates the danger of degradation of the cement caused by its being heated for extended periods.

The applying devices provide control over the consistency of the cement as applied, both chemically and physically. In addition, the cement is easy to store and handle and has good shelf life.

Because of the quick set of the cement, this new method encourages the development of new high-speed equipment for both new and existing products.

Speed-up in Use. In applications on continuous web materials, such as papers on bag-making equipment, speeds up to 500 ft./min. are possible. Because of the efficient manner in which the cement is applied in continuous operation, high yields per lb. are obtained. For applications such as in folded box making, plain or plastic-coated boxes can be bonded at rates up to 1500 boxes per minute.

To date, formulations of Thermogrip have been developed for bonding a wide variety of materials. Included are leather, kraft papers, polyethylene film, Polycel, polyethylene-coated boards and papers, some waxed papers, aluminum foil-coated boards, and plain board.

Vicious Fun

THE Scripps-Howard funny-man columnist on November 2 again made one of his annual attacks on plastics products. There is no doubt that it was humorous, but there is also no doubt that it was vicious. Humorous viciousness is about the deadliest possible manner of spreading propaganda. As he has almost always done in the past, the columnist listed his "bride's" complaints about plastics that break or otherwise fail. He quoted her as saying the only plastics she liked were "wood plastics."

Of course, he didn't mention that wood burns, rots, swells, splinters, warps, knicks, and is manna for insects.* Nor did he mention the shortcomings of such other materials as glass, rubber, concrete, metals, etc.

All of this brings to mind a little television incident of recent weeks that goes about like this:

The U. S. Steel Corp. has a very fine television program with a lovely young lady named Mary Kay who does the commercials. Says Miss Kay at every performance: "Nothing but steel can do so many jobs so well."

Miss Kay has recently appeared in Bell Telephone Co. advertisements as the lovely young lady who picks up the pretty new colored telephone set that Bell is featuring in the ad.

Guess what the telephone is made of—plastics, of course!

German Chemicals

SOME interesting facts about the German chemical industry were pointed out in a recent advertisement of Badische Anilin & Soda-Fabrik Aktiengesellschaft. This is the same company that announced production last September of high-pressure polyethylene in its plant, which is owned jointly with Deutsche Shell A.G.

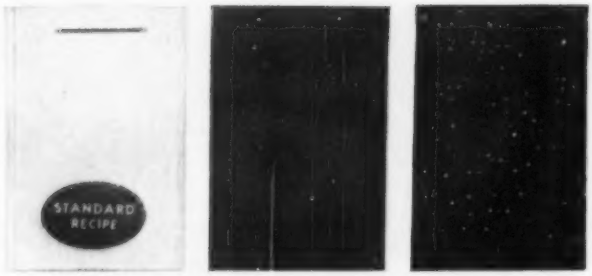
Badische Anilin's turnover in 1955 was $250 million, an advance of 18.6% over 1953. Sales in the home market increased 15% and in the foreign market 37.8 percent. The German chemical industry as a whole increased its share of world production from 5.4% in 1953 to 5.6% in 1954. In 1938 Germany's share was 21.9% of the world's chemical market.

Output of plastics in West Germany rose 35% from 246,000 metric tons in 1953 to 333,000 in 1954.

Badische Anilin expansions are now under way for production of polystyrols, polyamides, and polyvinyl chloride, as well as the lines marketed under the Oppanol brand. The company's Magnetophon recording tape made particularly encouraging progress and production capacity is being expanded.

Lacquer components sold well in 1954. Solvents suffered from severe

*When wood is treated with plastics materials, most of these undesirable properties can be eliminated.



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31.9¢

Now... save 8/10¢ per pound on vinyl compounds and have better color stability too!

The unretouched photo above shows the result of a heat test at 375° F. It needs little comment. You can see very clearly that Admex 710—one of ADM's epoxy vinyl plasticizers—is also a highly efficient stabilizer. *Indeed, it's a double-duty product.*

And now—consider your raw material costs. In this specific compound, reformulating with Admex 710 saves 8/10¢ per pound or $800 on every 100,000 pounds of compound. We have prepared complete test data on *eleven* such comparative vinyl formulations. Savings on these range from 3/10¢ to 1½¢ per pound. In every one of these formulations heat and color stability are much improved when reformulated with Admex 710.

Would you like more complete data on these eleven heat tests . . . plus information on Admex 711 and Admex 744. We'll be glad to send you the whole story. Just mail the coupon below!



SPECIFICATIONS

	Admex 710	Admex 711	Admex 744
Acid Value (Max)	0.3	0.3	1.0
Color (Gardner) (Max)	2.0	2.0	3.0
Viscosity @ 25° C (Stokes Approx.)	3.9	4.5	0.5
Refractive Index (Approx.)	1.471	1.472	1.4512
Specific Gravity @ 25° C. (Approx.)	0.991	0.998	0.909
Lbs. per gallon (Approx.)	8.25	8.31	7.56

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epoxy vinyl plasticizer

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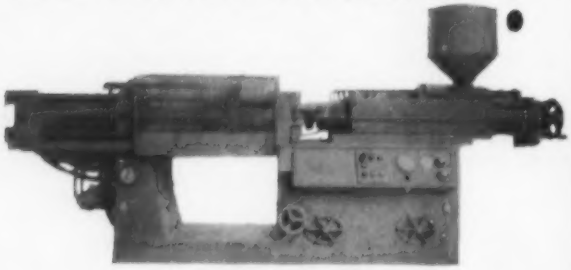
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2-3 ounces

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THE PLASTISCOPE

foreign competition. Sales of softening agents rose in proportion with plastics.

Research at Badische Anilin included the field of acetylene, olefine, and carbon monoxide chemistry. Styropor foam polystyrol had an excellent reception and the synthesis of terephthalic acid made considerable progress.

The company is proposing to raise its capital from $81 million to $121 million.

Rare Book Gift

OVER $100,000 worth of rare books has been presented to Akron University by Herman Muehlstein, president of H. Muehlstein & Co. Among the books presented by Mr. Muehlstein were an Elizabeth Barrett Browning first edition, George Chapman's first edition translation of Homer's "Iliad," and Charles Dickens' first edition of "The Adventures of Oliver Twist."

Oronite Isophthalic

CARLOAD shipments of isophthalic acid will soon be available from Oronite Chemical Co., a subsidiary of Standard Oil Co. of California, 30 Rockefeller Plaza, New York 20, N. Y. Isophthalic is being made by oxidation of meta-xylene in Standard of California's new 50 million lb.-per-year plant in Richmond, Calif. Benzoic and toluic acids are obtained as co-products. Present price of isophthalic has been established at 23¢ per lb. in carloads.

Isophthalic—meta-benzene dicarboxylic acid—is chemically similar to phthalic anhydride. It has a much higher melting point and is less soluble than phthalic anhydride. However, with slight changes in operating procedure, isophthalic can be used in place of phthalic in existing equipment to give products similar to phthalic products, but claimed to be superior in some respects. Phthalic anhydride supplies have been periodically short, due to fluctuating demand and scarcity of high-cost naphthalene.

In Polyvinyl Compounds—While isophthalic will probably find its largest use in oil-modified alkyds, its advantages in plasticizers, unsaturated polyesters, and high polymers will lead to wide usage in these fields. Dioctyl isophthalate, for example, is comparable in efficiency to dioctyl phthalate in polyvinyl chloride compositions, but the isophthalic product is said to be more permanent because of its substantially lower rate of loss by evaporation.

Resistance to extraction by water or soap solution is claimed to be better with the isophthalate, as is the high-temperature stability. Other isophthalic monomeric and polymeric plasticizers show similar advantages which should offset their slight premium cost.

Reinforced Plastics—In the field of fibrous glass-reinforced plastics, isophthalic may play a dual role, being used both as the sizing and the plastics component.

The use of isophthalic in unsaturated polyesters gives products which are claimed to have greater flexural strength, impact resistance, surface hardness, and higher heat distortion temperature than resins made with phthalic. The slightly higher cost of isophthalic can largely be overcome by using less maleic anhydride in the resin and more styrene in the final molding material. These products also have very good resistance to attack by fresh or salt water and detergent and soap solutions.

For specialty applications where diallyl phthalate is now being used, diallyl isophthalate gives a polymer of even higher softening point—close to 300° F. Combinations of diallyl isophthalate with isophthalic polyester show great promise for applications where high temperatures are encountered.

Easier Processing—In high polymers, isophthalic gives products similar in most properties to those obtained with terephthalic acid but having lower softening points and less tendency to crystallize—which should lead to easier processing for injection molding. The high polymer made from ethylene glycol and isophthalic can be formed into films and fibers having good orienting properties and high strength with a softening point of 140° F.—adequate for many uses. For higher softening points, mixtures of iso and terephthalic acid can be used. A mixture of 20% iso and 80% terephthalic produces a crystalline ethylene glycol high polymer with a melt point of about 230° C. Another crystalline high polymer can be made from isophthalic with tetramethylene glycol.

Adipic Replacement—As a replacement for adipic acid in polyamides, isophthalic has the important advantage of stiffening the polymer and reducing the tendency to crystallize without sacrificing toughness. Good, clear polyamide molding resins of excellent toughness and impact strength can be made from isophthalic and diamines by ordinary methods.

In rigid polyurethane resins, isophthalic contributes toughness, strength, and increased heat resistance without sacrifice of other qualities.

The new Standard of California plant uses a process which can produce either isophthalic or terephthalic acid, depending on whether meta or para-xylene is fed. In either case, several million pounds of mixed benzoic-toluic acid will be produced as co-products. It is Oronite's intention to market an alkyd grade of this mixed mono-basic acid at 15 to 20¢ a lb. within a few months.

Impregnated Reinforcements

PRODUCTION of Stanpreg preimpregnated materials for the electrical and reinforced plastics industries has been started by Standard Insulation Co., East Rutherford, N. J. Available in continuous lengths, Stanpreg offers many combinations of resin formulations and reinforcements.

For the electrical industry, Stanpreg offers phenolic-impregnated papers for both hot and cold punch operations, epoxy-impregnated papers, and epoxy-impregnated glass cloths. Also planned are polyester-, melamine-, and silicone-impregnated glass cloth and non-woven mat for electrical applications.

For the reinforced plastics industry, Stanpreg offers polyester-impregnated glass cloths and non-woven mats in a variety of standard and flame-resistant formulations for all types of molding. Also available

THE PLASTISCOPE

will be glass cloths and non-woven mats, cotton duck, asbestos, paper and synthetic fiber reinforcing agents impregnated with epoxy, phenolic, silicone, and other synthetic resins.

H. J. Ried, who has had a number of years of experience in this field, joined the company and will work with Joseph J. Coughlan on the sale and servicing of Stanpreg products.

Stretched Transparent Glazing

SUCCESSFUL production of stretched MIL-P-5425A and MIL-P-8184 polymethyl alpha-chloroacrylate sheeting in sizes up to 48 by 48 in. and in thicknesses from ⅛ to ⅜ in. has been announced by Swedlow Plastics Co., 6986 Bandini Blvd., Los Angeles 22, Calif. Polymethyl alpha-chloroacrylate is produced by General Aniline & Film Corp., 435 Hudson St., New York, N. Y., under the tradename Gafite.

Swedlow also announces the development of methods, techniques, and procedures whereby the flat-stretched sheets may be formed and fabricated into parts without significantly degrading the toughness of the stretched sheet.

The stretching process appears to involve unkinking or uncoiling of linear molecules and partially orienting them parallel to the directions of the stretch. Sheeting that is stretched 100% has ¼ the thickness and four times the area of the sheet from which it was made. A 75% stretched sheet would have approximately one third the original thickness.

Swedlow states that the effects of stretching on physical properties are: 1) Stretching improves the impact strength and greatly reduces the notch sensitivity of acrylic materials; 2) resistance to both solvent and stress crazing is greatly improved by stretching; 3) tensile and flexural strengths and modulus of elasticity are only slightly affected by stretching; 4) limited test data indicate that weathering is about the same as would be expected on unstretched acrylic sheet; 5) water resistance is about the same as for unstretched materials. The rate of water absorption increases with increase in temperature, as is also true for unstretched materials; 6) the thermal relaxation temperature of stretched materials is in the same range as the service temperature of unstretched materials; 7) above 4000 p.s.i. outer fiber stress, the creep of stretched materials is significantly lower than for unstretched materials at these loads; 8) tests made to date indicate that edge attachments on stretched acrylic sheeting may be cemented with the usual solvent or completely reactive cements without any degradation in the properties of the stretched material.

Because of the temperatures developed in flight at supersonic speed, the use of plastics materials with improved high-temperature properties is necessary for aircraft glazing. Dw/da values of stretched PMACA show a 5 to 10 fold increase over unstretched PMACA. The flexural strength of stretched PMACA increases from 21,000 to 33,000 p.s.i. when tested according to LP406A methods.

Swedlow has done considerable development work on the stretching of PMACA and the development of fabricating techniques. Although the material is not yet available in commercial quantities, the company states that it will be pleased to discuss customers' requirements for high-temperature-resistant enclosures and to furnish quotations for prototype parts.

Koppers Design Competition

FIVE scholarships in industrial design will be top awards in the second Housewares Design Competition for Plastic Molders, sponsored by Koppers Co., Inc., Pittsburgh, Pa.

The 1956 Competition has been expanded to include housewares made of polyethylene as well as polystyrene and is aimed primarily at encouraging the upgrading of all plastics products.

Heading the list of awards in the Competition is a two-year, full-tuition scholarship for the product rated "Best of Competition." A one-year, full-tuition scholarship will be awarded to the first-prize winner in each of the following four classifications:

Class I — Polystyrene products designed for use in the preparation, serving, or storage of food. (Examples: vegetable shredder, canister set, bread box).

Class II — Polyethylene products designed for use in the preparation, serving, or storage of food. (Examples: juice mixer, bowl, condiment dispenser.

Class III — Polystyrene or polyethylene products designed for decorative purposes. (Examples: wall planter, draperies).

Class IV — Polystyrene or polyethylene products designed for home maintenance use. (Examples: waste basket, sink strainer, towel rack).

Entries will be accepted from either the molder or the proprietary manufacturer of the eligible product, and the award will be given to the originator of the design. All molders, extruders, and fabricators of polystyrene and polyethylene housewares are eligible to enter.

A production sample of each entry to be judged must be received by the Design Competition Administration Committee, 1313 Koppers Bldg., Pittsburgh 19, Pa., no later than January 31, 1956.

Realignment at Du Pont

BECAUSE of increasing markets and a desire to serve its customers better, the Polychemicals Dept. of Du Pont Co. has arranged a broad realignment of its sales organization.

One of the interesting results of this policy is that nearly every division will have a product manager as well as a sales manager. The sales manager will be able to devote more time to improved service for customers and the product manager will be concerned with the development of a specific range of products and will provide a concentrated reservoir of product knowledge to help the sales manager meet customer needs. In some cases the functions of both sales manager and product manager will be combined in a marketing manager.

E. F. Schumacher continues to head up the sales divisions as general director of sales, but immediately under him will be two directors of sales—one heading up the sales development and service ac-



Hopewell's On Stream

with important new production of

Adipic Acid

No longer is there a stricture on the large scale output of products based on adipic esters. For National's Hopewell plant now adds substantial new basic production of Adipic Acid for the rubber, plastics, plasticizer, synthetic lubricant and chemical industries.

This production is completely integrated back to basic raw materials within the Allied Chemical group. The manufacturing process is efficient, continuous. The plant is modern, streamlined. The product is outstandingly good and completely competitive.

From present and prospective makers of adipates, adipic polyesters and polyurethanes, we welcome inquiries for samples, technical data, price and delivery quotations.

Send for TECHNICAL BULLETIN I-12

This comprehensive 8-page technical bulletin on National Adipic Acid gives physical and chemical properties; principal reactions of the carboxyl and alpha methylene groups; solubility curve, and suggested uses with copious literature references.

NATIONAL ANILINE DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

Boston Providence Los Angeles San Francisco Portland, Ore. Greensboro Chattanooga
Philadelphia Charlotte Richmond Atlanta Chicago Columbus, Ga. New Orleans Toronto

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tivity in industrial chemicals and the other in charge of the like organization in the plastics field.

John H. Daughtridge has been named director of sales for the technical service organization which handles such materials as methanol, ammonia, anti-freezes, and the like.

Russell C. Weigel will be in charge of the sales and technical sales service organization concerned with plastics, such as polyethylene, polyvinyl butyral, methacrylate, cellulose acetate, nylon, and Teflon.

Jerry D. Shaw has been named assistant director to head the staff concerned with Teflon, nlyon filament, polyvinly butyral resin, and cellulose acetate products.

C. D. Bell continues as assistant director under Mr. Wiegel to handle methacrylate, nylon, and polyethylene resins.

Albert A. Pavlic, formerly assistant manager of plastics sales, is now manager of plastic resin sales. Bailey H. Barnes, previously in the Detroit office, will become assistant manager of plastic resin sales.

F. E. Wintzer has become marketing manager of Butacite polyvinyl butyral resin and William A. Franta manager for Teflon.

Product managers are: Henry M. Cadot for Zytel nylon; Herbert S. Lecky for Alathon polyethylene; and Raymond E. Brady for Lucite methacrylate.

William E. Grigsby is the new manager of sales technical service and the assistant manager is Russell Akin, who was formerly the manager of the Chicago district office for plastics.

Polyethylene and Hypalon

IT IS well known that polyethylene is probably the fastest growing plastic in the world. But not too many are aware of one of its more unusual uses as a base material for Hypalon rubber. It is reported that this new Hypalon will withstand the most unusual treatment ever imposed on rubber.

According to a Du Pont (producer of Hypalon) bulletin, this new rubber is being used in a chemical plant on a covered elevator belt that carries hot salt through a 30 ft. long inferno where four gas jets heat the salt and drive out moisture. The salt temperatures average 302° F., but peaks of over 518° F. have been recorded. Previous belts had a service life of three months—the Hypalon belt lasted over six months.

Other uses for Hypalon are in heat-resistant spark plug boots on automotive engines, sheet packing for gasket use, wire coverings, and steam hose covers.

Urethane Producer

COMPLETION of manufacturing facilities for the production of polyurethane resins and foam materials has been announced by Pelron Corp., 7847 W. 47th St., Lyons, Ill.

President of the company, Paul E. Pelletier, states that Pelron has been doing research and development work on these foam resins for more than two years and is now in production on chemicals that will produce both rigid and resilient foams.

Electrical Laminates

A NEW polyester resin-bonded, asbestos paper laminate, which has proved to be a good substitute for mica as a commutator insulating material in d.-c. motors and generators, has been announced by National Vulcanized Fibre Co., Wilmington, Del.

Called Phenolite Grade APO-720, the product is said to give commutator makers a replacement for mica that is less expensive, easier to fabricate, and entirely practical for assembly of commutators with automatic machines.

Automotive engineers are reported to have found the laminate an improvement over mica in their low voltage generators and starting motors.

The company also announces that production quantities of a glass-base sheet laminate bonded with an epoxy resin are now available. Designated as Grade G-10-860, the material is an addition to its line of Phenolite fibrous glass laminates.

Grade G-10-860 is primarily for electrical and electronic uses where the unique properties of the epoxy resin offer definite advantages. It is supplied as either a standard laminate or with copper foil on one or both sides for printed circuits. The flexural strength of the material at room temperature is approximately 50,000 p.s.i. It retains better than 50% of this strength after exposure to 130° C. for one hour.

Styron in Britain

A NEW Anglo-American partnership in the plastics field has been established by the formation of Distrene, Ltd. Jointly owned by Distillers Co., Ltd. and The Dow Chemical Co., Midland, Mich., the new company will produce Styron.

A Styron plant has recently been completed on a 92-acre site at Barry, South Wales. Production capacity is expected to be from 6000 to 7000 tons per year. The new plant is also occupied by two Distiller affiliates, British Resin Products, Ltd. and British Geon, Ltd.

Head office of Distrene is at Devonshire House, London, W. 1, England, from where sales will be promoted and directed by British Resin Products, Ltd. as sole selling agent.

As its initial step, Distrene will produce polystyrene molding materials and toughened polystyrene for sale in England under the name of Styron and in the United States under the name of Distrene.

Peter Delafield is sales director of the new company and managing director of British Resin Products.

Sebacic Acid Price Reduced

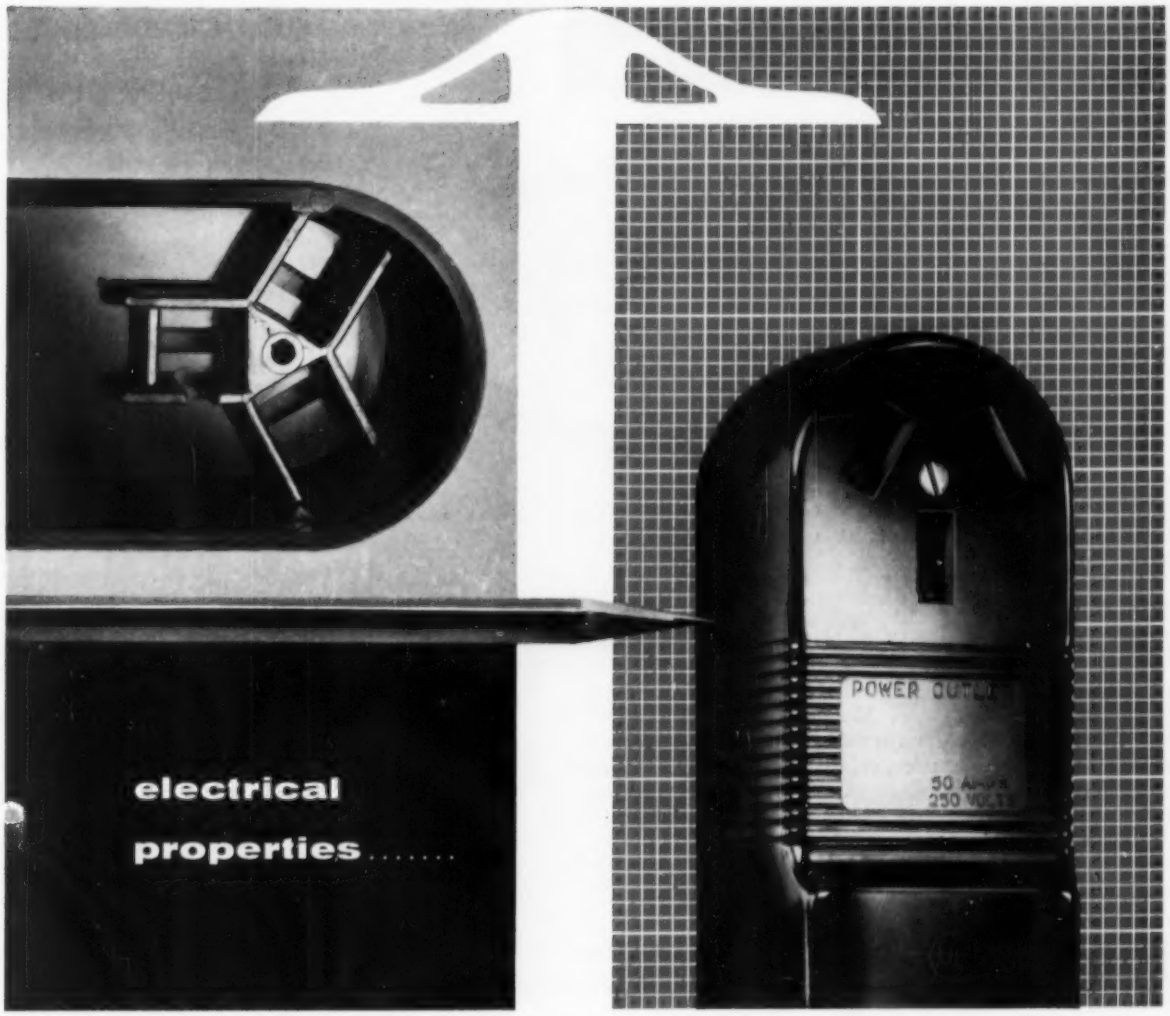
SECOND substantial price reduction on sebacic acid in recent months has been announced by Harchem Div., Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N. J.

Sebacic acid is used as a basic raw material in the production of plasticizers and resins. Harchem Div. expects that the reduced price will provide the basis for additional and new uses for sebacic acid in view of the upward trend of most other chemical prices.

Dacron Reinforcement

DACRON blankets for use in reinforced plastics laminates are being offered by Troy Blanket Mills, 200 Madison Ave., New York, N. Y.

The company makes some strong claims for its Troytuf Dacron blankets in comparing it with fibrous



mold it with DURITE GP-102

When products such as this electrical power outlet housing must be molded to withstand the high voltage needed to operate domestic ranges and dryers, manufacturers rely on DURITE GP-102.

This pace-setting phenolic molding compound has electrical properties that make it ideal for this type of job. What's more—the fast cure of DURITE GP-102 can provide higher output per press whether your moldings are large or small, intricate or simple.

In addition, dimensional stability is assured in every piece you mold because the batch to batch uniformity of GP-102 is carefully controlled from selected raw materials to the finished compound. We'd like you to prove it to yourself with a trial run in your plant.

For a sample in black or brown—or to have a Durite technical representative make the demonstration, write: The Borden Company, Chemical Division, Durite Products Dept. MP-125, 5000 Summerdale Ave., Philadelphia 24, Pa.

DURITE

THE *Borden* COMPANY

CHEMICAL DIVISION

Phenolic Molding Compounds • Abrasive and Frictional Bonding Resins • Molding and Specialty Resins • Lamp Basing Cements

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glass materials. Here are some of them: "abrasion resistance superior to a comparable glass mat-reinforced laminate; improved electrical properties; more flexible; 54% lighter; and safer materials for food or drug handling."

In test operations the Dacron laminates contained 66% resin and 34% Dacron. The glass laminate was 55% resin and 45% glass.

The blanket will be made in weights of 1 and ½ oz. per sq. foot. The 1-oz. material will sell for approximately 19¢ per sq. ft. and the ½ oz. for 10 cents.

Collapsible Tubes

AMONG the latest applications for Bracon polyethylene dispensing containers, produced by Bradley Container Corp., Maynard, Mass., are the packaging of sun-tanning creams, liquid and cream deodorants, plant foods, "do-it-yourself" home hair lightener, and a nasal spray.

The polyethylene containers for the nasal spray and liquid deodorant are manufactured by a European process, of which Bradley is the exclusive user in the United States.

Polyethylene for Paper Coating

COMMERCIAL production of Dow Polyethylene 700 C, paper coating grade of polyethylene, has been announced by The Dow Chemical Co., Midland, Mich.

The new product, which is produced at the company's recently completed polyethylene plant in Freeport, Texas, is now available in quantity to paper manufacturers and converters.

Varnish for Printed Circuits

PROTECTIVE insulating coatings for modular assemblies, printed circuits, and printed circuit components, can be provided by a new varnish especially designed for these purposes by Schenectady Varnish Co., P. O. Box 1046, Schenectady 1, N. Y.

Claimed to be far more flexible than conventional coatings, the Schenectady #642 printed circuits varnish can be baked or air-dried to a tough, resilient coating that completely seals the laminate and component leads against arc-producing moisture. The varnish will not support tracking, nor will it char.

Engineering information on the new printed circuit varnish may be obtained from The Insl-X Sales Co., 26 Rittenhouse Place, Ardmore, Pa.

New Officers

ELECTION of the following officers has been announced by Association of Consulting Chemists and Chemical Engineers, Inc., 50 E. 41st St., New York 17, N. Y.:

President: Carl Bussow, A. W. Dow, Inc.

Vice president: Foster Dee Snell, president of Foster D. Snell, Inc.

Secretary: Earl D. Stewart, director of research, Schwarz Labs., Inc., Mt. Vernon, N. Y.

Treasurer: William C. Bowden, secretary-treasurer of Ledoux & Co., Inc., Teaneck, N. J.

Deodorizer for Polyurethane

DEODORIZING polyurethane plastics is the purpose of Witco Chemical Co.'s odor-free emulsifier-coupler.

In announcing the new product, called Witco 77-86, Dr. E. F. Wagner, technical service director, states that it had been widely tested and used on a semi-commercial scale in the production of polyurethane foams. It has been shown that these foams remain odor-free after prolonged heating which simulates long periods of actual use.

New Synthetic Fiber

A MAN-MADE fiber different chemically from any now on the market has been announced by John R. Hoover, president of B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, Ohio. The material, called Darlan, is now in pilot plant production at Avon Lake, Ohio.

Mr. Hoover states: "Darlan is versatile and can be adapted for almost every type of wearing apparel ranging from sweaters and knit goods to coats and suits. It is a dinitrile fiber on which our research and development teams have been working for several years. The dinitrile chemical (1, 1 dicyanoethylene) was a theoretical material as far back as World War I, but it had never been successfully produced heretofore."

To a layman, the chemistry behind this new product is as difficult to decipher as the characters of a Chinese alphabet. The best we can figure out is that acrylonitrile is one of the basic materials from which the chemicals used in making Darlan are produced and that one of them is vinylidene cyanate. It is also possible that this new material may turn up some day as a new base from which plastics materials can be produced.

Plastisol Coating

PUBLICATION of Data Sheet #75, Quelcor Plastisol Coatings, has been announced by Quelcor, Inc., Front and Broomall Sts., Chester, Pa. The data sheet describes in detail the company's corrosion-resistant plastisol which can be heat-fused onto a metal base and cured into a smooth, tough, resilient surface coating.

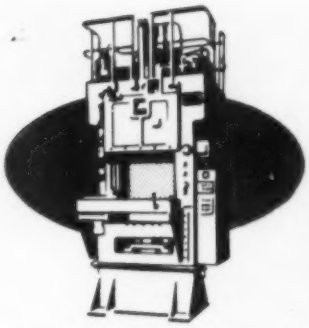
Quelcor plastisols are said to provide a seamless, non-porous, non-aging, tough, and abrasionproof coating highly resistant to chemical action and capable of furnishing dependable and long-life protection against corrosion. The coatings are chemically inert to virtually all inorganic reagents, such as mineral acids, alkalies, and salts, and to many organic compounds.

Another Plastic-Glass Boat

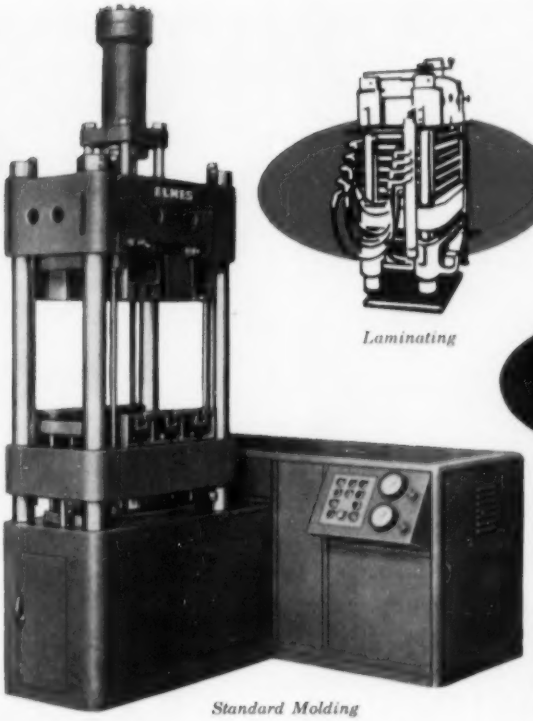
MANUFACTURE of its latest model, Dyecraft 29 Sport Fisherman, has been announced by The Anchorage, Inc., Warren, R. I.

The hull of the boat is constructed of the company's Dyeresin fibrous glass-polyester and finished on the inside with a fire-resistant resin. The design makes the boat extremely easy to handle in a quartering or following sea. Anchorage states that a hull of this shape would be prohibitive in cost as a stock model constructed of wood, but in the reinforced plastic field, the company can offer this perfected hull at a figure but slightly higher than standardized wooden cruisers of the same size.

The company has built 36-ft. LCVP's for the United States Navy;

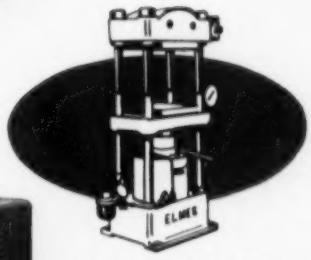


Special Design Transfer Molding

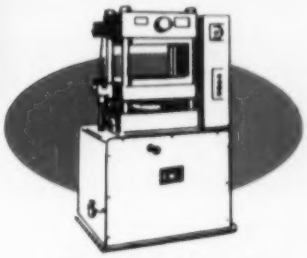


Standard Molding

Laminating



Laboratory and Small Production



Hydrolair (Air-Powered)

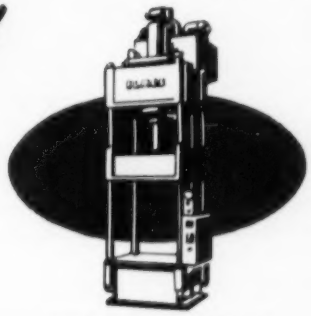
Elmes...

builds plastics molding presses to meet your needs—*exactly*

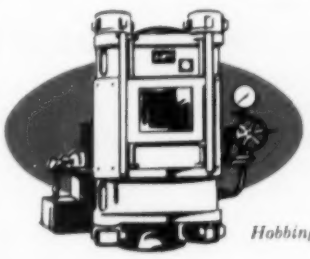
Elmes equipment for plastics molders includes a complete line of standard compression and transfer presses . . . laminating, laboratory and small production presses . . . low-cost, air-powered Hydrolair® presses . . . presses for reinforced plastics molding . . . hobbing presses for die making . . . and pump-accumulator systems for group press operation.

If your production requirements are unusual, Elmes engineers can develop *specially designed presses* precisely fitted to your individual needs. Providing "custom-built" equipment is and always has been a large and important part of Elmes service.

Backed by more than a century of engineering experience, Elmes equipment is recognized throughout the plastics industry for its performance, its proven quality and dependability. Let Elmes' long experience be your guide to faster, better, lower-cost production. Recommendations and cost estimates are yours for the asking.



Reinforced Plastics Molding



Hobbing

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HYDRAULIC PRESSES & EQUIPMENT

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"Plant shutdowns are prevented!



. . . thanks to our RCA METAL DETECTOR"

. . . Says Plastics Plant Executive

Metallic impurities not only cause defective areas in the finished sheet of polyvinyl chloride compounds, but they often render serious harm to processing equipment. "Extraneous metal parts present in raw materials are removed thanks to our RCA Metal Detector," says Mr. A. J. Hanley of Respro, Inc., Cranston, R.I. "A complete shutdown would be necessary for a period of 2-3 weeks or longer, if the metal damaged the calender rolls."

The RCA Metal Detector finds both magnetic and non-magnetic metals—even nickel, lead, brass and stainless steel.

Why take a chance on product rejects or costly shutdowns due to tramp metal? Protect your profits by installing an RCA Metal Detector in your plant.

RADIO CORPORATION of AMERICA
CAMDEN, N. J.

In Canada: RCA VICTOR Company Limited, Montreal

RADIO CORPORATION of AMERICA
Dept. Z-75, Building 15-1, Camden, N. J.

Please send me information on the RCA Electronic Metal Detector for plastics applications.

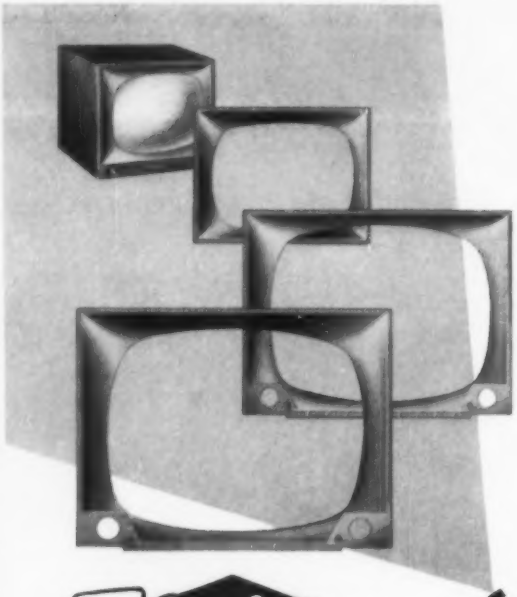
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In television . . .



NELCO



Lacquers

frame the best pictures

The lacquer finish on the polystyrene "mask" or frame (shown above) surrounding the picture tube is vital to good TV viewing. Glare and reflection must be reduced to a minimum and colors must blend attractively with the television cabinet.

Here is how NELCO Lacquers serve one major television manufacturer:

The Problem
To lacquer finish black polystyrene "masks", attractively, economically.

The Answer
Production-line, hand-spraying with one coat of flat, fast drying NELCO Polystyrene Lacquer.

The Results
Handsome, no-glare, non-reflective finish.
Scratch and blush resistant.
Excellent adhesion.
Reduction of costs. No-glare lacquer replaces expensive etching of metal molds.

NELCO lacquer formulations are available in all metallic shades for every coating requirement—cellulose acetate, vinyl, acrylic, cellulose acetate butyrate and rubber. Write for complete information on these lacquers and, for our recommendations, just outline your problem to us.

Chemical Products CORPORATION
KING PHILIP ROAD • EAST PROVIDENCE, R. I.

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40-ft. twin-screw Diesel utilities for the United States Coast Guard; a 42-ft. auxiliary ketch, "Arion," back in 1950; and more recently a 33-ft. Sojourner Class all-plastic auxiliary sloop.

Styron Sheet Prices

PRICES on Styron 475 sheet have been recently reduced by the Dow Chemical Co., Midland, Mich., as follows: sheets in regular finish in quantities of 40,000 lb. and over vary from 54 to 64¢ a lb., depending upon the gage; quantities from 20,000 to 39,999 lb. vary from 55 to 65¢ a lb.; and high gloss sheets range from 56 to 59¢ a lb. in lots of over 40,000 pounds.

Stabilizer for Foam

COMMERCIAL quantities of lauryl alcohol are now being offered by American Alcolac Corp., 3440 Fairfield Rd., Baltimore 26, Md. A "narrow cut" containing 95% C_{12}=C alcohols is available under the tradename Siponol L2, as is also a broader cut, Siponol L5.

These alcohols find their major use as intermediates for surfactants and as foam and emulsion stabilizers. The availability of high purity tallow alcohol was announced previously.

Samples and data sheets may be obtained from the company's Development Department.

Printed Circuit Licensees

A FIVE-YEAR license agreement was recently signed by Radio Corporation of America with Technograph Printed Electronics, Inc., Tarrytown, N. Y., which enables R.C.A. and its subsidiary companies to produce printed electrical circuits under the Technograph patents and pending applications and by the Technograph processes, according to Hubert L. Shortt, president of Technograph.

Technograph holds patents on techniques of producing printed wiring boards now used extensively in TV and radio sets, as well as in the manufacture of other electronic and electrical devices.

By this recent license, R.C.A. joins other leading American manufacturers who have accepted Technograph licenses. These licensees include American Hard Rubber Co., Baldwin-Lima-Hamilton Corp., Cornell Dubilier Electric Co., Formica Co., Hallicrafters, Inc., National Vulcanized Fibre Co., and Photocircuits Corp.

Lower Acrylate Monomer Prices

PRICE reduction of 4¾¢ per lb. for tank car quantities of methyl and ethyl acrylate monomers has been announced by Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa. The new tank car prices on a delivered basis are 34¢ per lb. for ethyl acrylate and 37¢ per lb. for methyl acrylate.

The company states that this is the fourth major price reduction on these products since 1949.

Phillips Licenses Union Carbide

CONSUMMATION of an agreement with Phillips Petroleum Co., Bartlesville, Okla., for a license under the Phillips patents involving low-pressure polyethylene has been announced by George C. Miller, president of Bakelite Co., a Div. of Union Carbide and Carbon Corp. Under the agreement, Union Carbide has the rights to produce polyethylene of the general types presently identified by the Phillips tradename Marlex.

Mr. Miller states that Bakelite has thoroughly surveyed the potential market for the newer low-pressure polyethylenes. Although these materials when readily available are expected to have some effect on markets presently served by high-pressure process polyethylenes, he feels that the major effect will be on markets currently served by other materials.

Barium Cadmium Stabilizer

TRADENAMED Advastab X23-30, a new liquid barium cadmium compound has been announced by Advance Solvents & Chemical Corp., 245 Fifth Ave., New York 16, N. Y. The company claims it to be an outstanding heat and light stabilizer suited for straight P.V.C. as well as copolymer resins. The compound is suggested for all types of vinyl operations, such as calendering, extrusion, and plastisol molding applications.

Advastab X23-30 is asserted to have an advantage over other one-package barium cadmium systems in that no epoxy plasticizer is necessary in the formulation to improve heat and light stabilization. Excellent clarity and long term heat stability is obtainable with the stabilizer alone in formulations containing only D.O.P. or other primary plasticizers.

Aluminum Putty

SEVERAL automotive companies, machine shops, foundries, and various other firms are now using Devcon F, which consists of approximately 80% aluminum and 20% plastic, to fill large and small holes in aluminum and steel castings, to cover holes which have been drilled incorrectly, and to build up worn sections. The new material is as easy to use as modeling clay. It is reported that a large mass can be applied to a vertical surface and will not run or sag.

Devcon F, produced by Chemical Development Corp., Danvers, Mass., is claimed to have excellent adherence to aluminum and steel, as well as to bronze, brass, and cast iron. The material will not bond to a flat surface and can be machined to a feather edge. It is not necessary to undercut the metal or treat it in any special way. Devcon F, it is claimed, will not shrink or pull away during hardening as no volatile solvents or thinners are used with the compound.

Celanese Chemical Distribution

A NEW storage terminal has been established in Newark, N. J., by Celanese Corp. of America's Chemical Div. as the eastern distribution center for a broad list of liquid and dry chemicals produced by the company. One of the nation's largest facilities of its kind operated by an individual chemical company, the terminal has initial storage capacities of 4 million gal. of liquid chemicals and 1 million lb. of dry products, as well as a substantial drumming capacity.

The company states that, theoretically, every one of the more than 50 different chemicals manufactured

by its Texas plants can be handled through the new terminal. Celanese is equipped to spoon-feed its customers or supply them with tank car quantities. Among the important consumer products which will be supplied from the terminal are intermediates, plasticizers, and solvents.

Approximately 15 miles of piping leading to storage tanks and loading points have been installed. Each tank is earmarked for a specific chemical and has its individual transfer pump and line. This system eliminates the necessity of cleaning lines, as would be necessary if the tanks and lines were used for multiple chemicals. Moreover, contamination hazards are obviated.

When in full production, the Newark terminal will be the nerve center for the entire national distribution system of the company's Chemical Div. It will control both the delivery and inventory programs of Celanese terminals and warehouses now located in Carteret, N. J.; Chicago, Ill.; Oakland, Calif.; and Corpus Christi, Texas. The terminal will be linked to those points by teletype.

New Plant in Louisiana

FORMATION of Pelican Plastics, Inc., Homer, La., as a producer of vacuum formed and injection molded items has been announced. R. G. Berryman, Jr., president of the company, states that initial plans call for the manufacture of signs and displays, panels for large-area illumination, toys, containers, etc.

The Town of Homer will vote on a bond issue to finance the erection of a permanent building for Pelican Plastics, which will be located on a large industrial site given for the purpose by the town's Development Corp.

Nylon-Vinyl Truck Cover

A NEW vinyl-coated nylon truck cover, which is asserted to give longer service and require fewer repairs than conventional covers, has been developed by Webb Mfg. Co., 4th and Cambria Sts., Philadelphia 33, Pa.

The product, coated with Goodrich Geon vinyl resin, has electrically welded seams which are both leakproof and tear resistant. The fabric is translucent, permitting visibility inside the trailer.

The company states that during road tests, the cover stood up for nine months of continuous service without need of repair. There was no cracking or peeling.

Repair kits, which may be purchased with the covers, contain a quart of special adhesive and several pieces of new material.

Correction for Vinyl Foam

THE following letter was received to correct an error printed in the item, "Vinyl Foam Fabricator," which appeared in the Plastiscope section of the October issue of MODERN PLASTICS. The article in question referred to the use of vinyl foam distributed by Presto Mfg. Co., Brooklyn, N. Y., and which is being used for novelties, shoe soles, automotive, and many other applications:

"We are disturbed over the statement in your October Plastiscope where you say 'vinyl foam is not recommended for shoe soles or automotive upholstery since it has a fusion point of about 160° F.' In fact, the automotive applications have been one of the more promising products. As you probably know, Ford is doing quite a job in using vinyl foam in crash pads and sun visors on the 1956 cars. Vinyl arm rests have been used extensively. There are also some vinyl foam seats in the New York subway system and we expect them to operate as well or better than competitive materials.

"Technically, the wording of your sentence is wrong in that the fusion point of vinyl foam is approximately 360 to 380° F., but the softening temperature is around 160° F. We do not yet recommend vinyl foam for automotive seating because we are being cautious about cars used in the desert areas, but we feel that it may well do a good job in many automotive applications."—G. A. Fowles, manager, Plastic Materials Sales, B. F. Goodrich Chemical Co.

(Ed. Note: Oops! Our reporting was bad. Our wording was bad. Hope this correction straightens out the reader on properties and performance of vinyl foam).

PIPE NOTES

Reinforced Pipe — The idea that somebody, some day, somehow will produce a commercially practical fibrous glass-reinforced pipe in large volume apparently won't die. Many people retain confidence in the magnificent but elusive possibilities, even though after seven or eight years of experimentation the project is still on a trial and error basis with very few commercial applications in sight.

But the Reinforced Plastic Pipe Standards & Technical Committee continues to meet twice a year to go over their troubles. From 40 to 60 persons, representing approximately 30 material suppliers, manufacturers, and users, dutifully attend each meeting. It is obvious that a lot of people are intent on somehow finding the gimmick that will make fibrous glass-reinforced pipe a commercial reality.

P.V.C. Pipe and Fittings — For the first time, Corning Glass Works, Corning, N. Y., will display its new Corning brand P.V.C. pipe and fittings at the 25th Exposition of Chemical Industries in Philadelphia, Pa., on December 5.

The polyvinyl chloride pipe and fittings will be distributed by the company for low-cost conveying of corrosive fluids at moderate temperatures (140° F. and under). Corning's new line of rigid unplasticized P.V.C. pipe will be available in 10-ft. or custom-ordered 20-ft. lengths through the regular distributors of Pyrex brand double tough glass pipe.

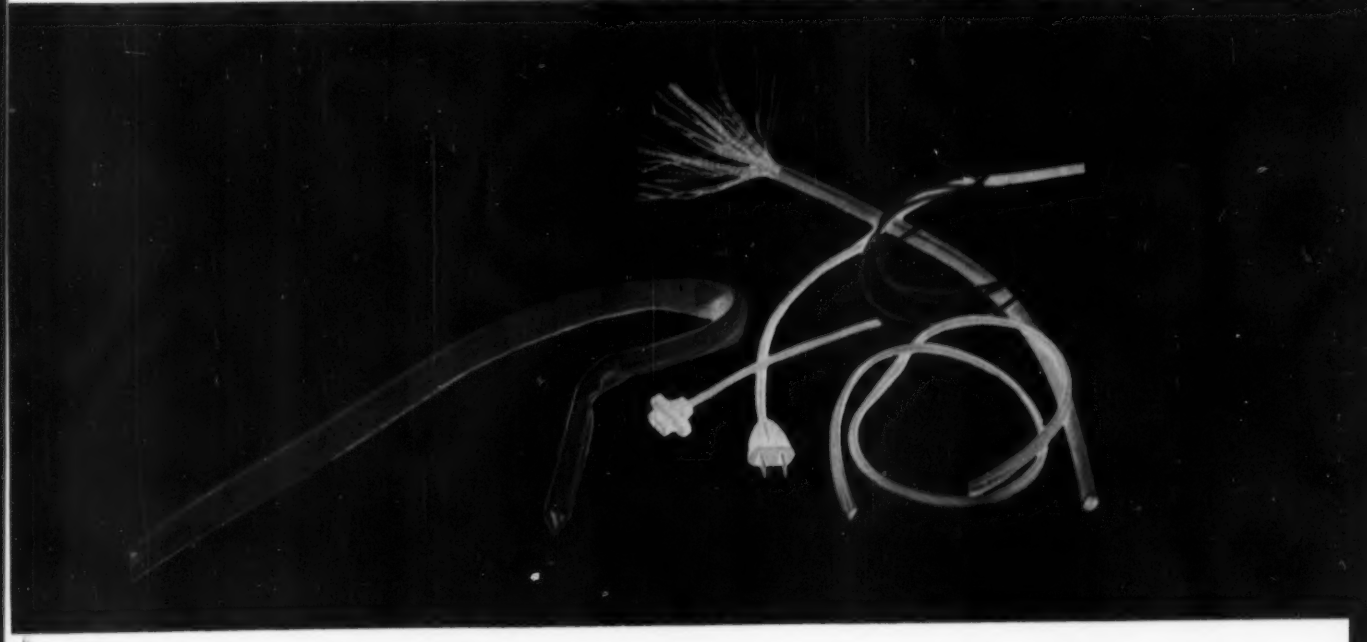
Steel Maker Introduces Plastic Pipe — Lightweight, polyvinyl chloride pipe has been announced by U. S. Steel Corp.'s National Tube Div. Twenty ft. of its 2-in. pipe weigh less than 13 pounds. Vinyl fittings can be applied by heat welding, cementing, threading, or adhesives, according to the company.

Vinyl-Glass Hose — Production of a lightweight, portable, and labor-saving irrigator, called Ro-Flo, has been announced by Carlisle Corp.'s

Faster mixing of dry blends!



OPALON* 300-FM *(vinyl chloride resin)*



speeds production of wire and cable

*OPALON REG. U. S. PAT. OFF.

All dry blend mixing can now be faster and more efficient. Opalon 300-FM vinyl chloride resin has a rapid and uniform rate of plasticizer absorption. It quickly dries up extrusion and injection molding blends.

There are other advantages, too: Opalon 300-FM brings you outstanding heat stability, clarity and pigmentation characteristics.

Its excellent physical and electrical properties recommend it to wire and cable extruders. It has been accepted by Underwriters' Laboratories as interchangeable with other approved vinyl chloride resins.

Not only is Opalon 300-FM the ideal resin for dry blend processing. Its remarkable qualities are equally valuable in mill-mixing or intensive-mix processing.

For technical bulletin, write to Monsanto Chemical Company, Plastics Division, Dept. MP-12, Springfield 2, Massachusetts.

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Mobile Plastics Div., Mobile, Ala. The water-conveying system is fabricated from woven glass cloth coated with a vinyl plastisol. The combination of these two materials results in a hose that is waterproof, non-absorptive, mildewproof, and high in tensile strength.

The irrigator consists of a main line hose, to which is attached a distributor length with sleeve outlets spaced to irrigate each planted row. Flow of water to each row can be controlled by a closure device.

The Ro-Flo irrigator is claimed to eliminate the necessity for digging ditches and is economical. No permanent installation is necessary—the hose can be rolled or folded for portability and storage. A 250-ft. section of 8-in. hose weighs only 50 pounds. Ro-Flo is available in 4-, 8-, 12-, and 16-in. diameters.

The vinyl plastisol used is supplied by Flexible Products Co., Marietta, Ga.

EXPANSION

B. F. Goodrich Chemical Co., Cleveland, Ohio, announces that a $3.5 million chemical plant will be built by **B. F. Goodrich Canada, Ltd.**, near Niagara Falls, Ont., for the production of Geon polyvinyl materials. Goodrich engineers will work in cooperation with the technical staff of the Canadian firm in the design and construction of the new facilities.

The announcement, made in Canada by **Ira G. Needles**, president of the Canadian company, stated that construction of the new plant, located between Welland and Niagara Falls, will start early next year, with completion scheduled for early 1957. The new facilities will be operated as a chemical division of B. F. Goodrich Canada, Ltd., with headquarters in Kitchener, Ont. B. F. Goodrich had previously announced a $3.5 million expansion at Kitchener.

Monsanto Chemical Co.'s Plastics Div. announces plans for a multimillion dollar expansion of ethylene production facilities at its plant in Texas City, Texas. Capacity will be increased by 150%. Construction of the new facilities is expected to get under way next March and should be operating by early 1957.

The Texas City plant uses ethylene as an intermediate in the manufacture of polyethylene, styrene monomer, and vinyl chloride monomer. Monsanto's entire ethylene production is earmarked for internal use.

The Plastics Div. also announces that it plans to triple its production capacity of vinyl chloride paste resin at its plant in Springfield, Mass. The new facilities are expected to go on stream in the second quarter of 1956.

Holiday Plastics, Inc., which recently acquired the **Thermacote Cos.** of New Jersey, has taken another step to expand operations by leasing new production headquarters at 1301 Fairfax Trafficway, Kansas City, Kan. Holiday, together with the Thermacote Cos., will be able to triple its production within the near future, according to **George K. Frischer**, president of Holiday.

Approximately 80% of the Thermacote companies' output is thermoplastic in nature. They have concentrated on sales of proprietary methacrylate products to the ice cream and dairy industry, particularly lids for deep freeze cabinets.

The welding division of the firm sells various metal and plastics accessories to welding jobbers through 16 of its own commission-agent salesmen throughout the United States.

The Thermacote organization recently signed a $3 million contract to produce fibrous glass swimming pools for **Cinderella Glass Pool Co.** of California. The pools are oval-shaped 30 by 15 feet. Other sizes are expected to be available shortly. The present pool, completely installed, markets in different localities from $2500 to $3000.

National Starch Products, Inc., 270 Madison Ave., N. Y., has let it be known that the company is planning a three-year building program for the manufacture of chemical products just as soon as its new Meredosia, Ill., plant has been "broken in." The plant, which went into full production in August of this year, is the first National facility devoted entirely to chemical production and manufacturing. For the time being only vinyl polymers will be produced there.

Another first in the company's history is the use of four-color advertising in national magazines. Company officials also point out that their company's common stock has been placed in the investment fund portfolios of both the Chemical Fund and Investors Diversified Service.

The Goodyear Tire & Rubber Co., Inc. announces that work will start soon on a $3.5 million capacity increase to its Chemigum and resin plant in Akron, Ohio, which will double the plant's present capacity for production of nitrile rubbers and latices.

The plant is part of Goodyear's recently announced $100 million expansion program. Increased production is expected to start rolling early in 1956 and the entire project completed by August of next year.

Besides boosting the production of the company's special synthetic rubber, Chemigum, the new facility will also provide for increases in the manufacture of Plio-Tuf thermoplastic resins and Pliolite resins and latices which are also produced at the Chemigum plant.

Shell Chemical Corp. announces the dedication of its new allyl chloride and chlorohydrins plant at Norco, La. **R. C. McCurdy**, president of Shell, states that the company was formerly making about one-fifth of the United States' glycerine output—it is now making more than one-third. At present the Norco plant's output is shipped to Shell's plant at Houston, Texas, for final processing into glycerine.

Further expansion of the plant is planned. The first addition, construction of which will begin soon, will be a unit designed to make more than 30 million lb. a year of hydrogen peroxide. According to Mr. McCurdy, eventually an acrolein unit and a unit designed to produce glycerine by an entirely new process utilizing hydrogen peroxide and acrolein will be built.

Welcast Plastics Co., 721 E. Baird Ave., Barberton, Ohio, announces that its new plant at 50 E. Springfield Rd., Barberton, is now in full production. The new facilities have

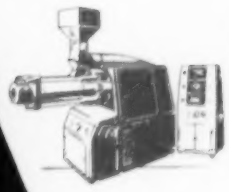
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R.C.65. This is a twin-screw variable speed extrusion and compounding machine with an hourly output of 65 lb. plus. An automatic feeding device for metering plastic material to the extrusion screws is incorporated and automatic heating regulation is provided.



R.C.200. Three screws provide this heavy duty machine with exceptional mixing powers. With a nominal output of 200 lb. per hour, constant extrusion pressures, and trouble free operation, it satisfies the demand for a multi-screw machine of really high output.

The photographs on this page are by courtesy of Messrs. Wallington Weston & Co., Ltd., Frome, Somerset, England. The R.C.100 extruding 6" outside diameter pipe from "Fromoplas HT" material.

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greatly increased production for CR 39 welding lenses, cast sheets, and copolymer sheets. A new department at the plant handles custom fabrication of these products in desired sizes, thicknesses, and shapes.

Witco Chemical Co., 122 E. 42nd St., New York 17, N. Y., has opened a new metallic stearates plant in Los Angeles, Calif. Plant operations will be headed by **S. M. Freeman**, West Coast regional vice president.

Production of metallic stearates is reported to exceed 22 million lb. annually. Stearates find industrial uses as viscosity modifiers and as flatting, lubricating, and stabilizing agents. Witco's plants produce, among others, aluminum, calcium, magnesium, lithium, and zinc stearates for improved suspension, flatting, and other applications.

The company now produces paint driers, vinyl stabilizers, plasticizers, and carbon black.

Transparent Products Corp., 1739 W. Pico Blvd., Los Angeles, Calif., announces the completion of a larger plant at 689 Harrison St., San Francisco, Calif., to handle expanding sales in northern California and the Pacific Northwest.

The company states that the expansion, which will provide for the establishment of warehouse and converting facilities formerly handled only in the Los Angeles plant, will result in more direct service to plastics sheeting and film customers.

Automatic Molding Machine Co. has opened a new plant at 3217 Exposition Place, Los Angeles 18, Calif., to manufacture an Automold high-speed automatic compression molding machine. The Automold A25 (25-ton capacity) and A50 (50-ton capacity) are fully automatic and require no operator to install and supervise.

John Alesi is in charge of the operation.

Wiggins Plastic Molding Co., Inc., 317 Cortlandt St., Belleville, N. J., announces that plans are under way to move its entire facilities to a new plant at 10 Kingsland Rd., Clifton, N. J. The new facility, on a 2½-acre site, will enable the company to more than double its present production capacity. The firm is engaged in compression, transfer, plunger, and fully automatic molding.

Ell-Bee Chemical Co. announces the opening of a new plant at Hanover, N. J., and the formation of a new division to market thinners for dip, spray, flow-coating, or other thinner applications.

The company states that the new division, using new production methods, can formulate thinners to any specification at prices up to 20% below current market quotations.

Specializing in thinners for polystyrene, leather, and metal etching, Ell-Bee can produce synthetic reducers or retarders to customers' specifications. Shipment is made in tank truck, drum, or 5-gal. quantities.

Federal Tool Corp., 3600 W. Pratt Blvd., Chicago 45, Ill., has added 30,000 sq. ft. of manufacturing facilities to its present plant. This is the company's second expansion, bringing the total manufacturing space to 175,000 sq. feet.

Reed Plastics Corp., 116 Gold St., Worcester, Mass., processor of thermoplastic materials, has acquired two new warehouses. The company states that the new additions will permit an expansion in its main plant facilities and a 30% increase in production capacity.

Industrial Research Laboratories, Div. of Honolulu Oil Corp., 961 E. Slauson Ave., Los Angeles 11, Calif., announces that its plant is being increased by almost 100% to meet the expanded demand for Xaloy and Xaloy 306 extruder liners.

Durable Formed Products, Inc., 6 Greene St., New York 13, N. Y., has installed additional manufacturing equipment. A total of over 20,000 sq. ft. of floor space will be devoted to thermoplastic sheet forming and fabricating.

Standard Tool Co. has consolidated all its plants into a new building at 217 Hamilton St., Leominster, Mass. The company, in existence 44 years, specializes in the manufacture of fabricating machinery and the engineering and design of injection and compression molds, casting dies, and beryllium cast cavities.

COMPANY NOTES

Shawinigan Resins Corp., Springfield, Mass., which earlier this year assumed responsibility for the sale of its products from parent companies **Monsanto Chemical Co.** and **Shawinigan Products Corp.** has completed the first phase in the organization of a nationwide sales staff.

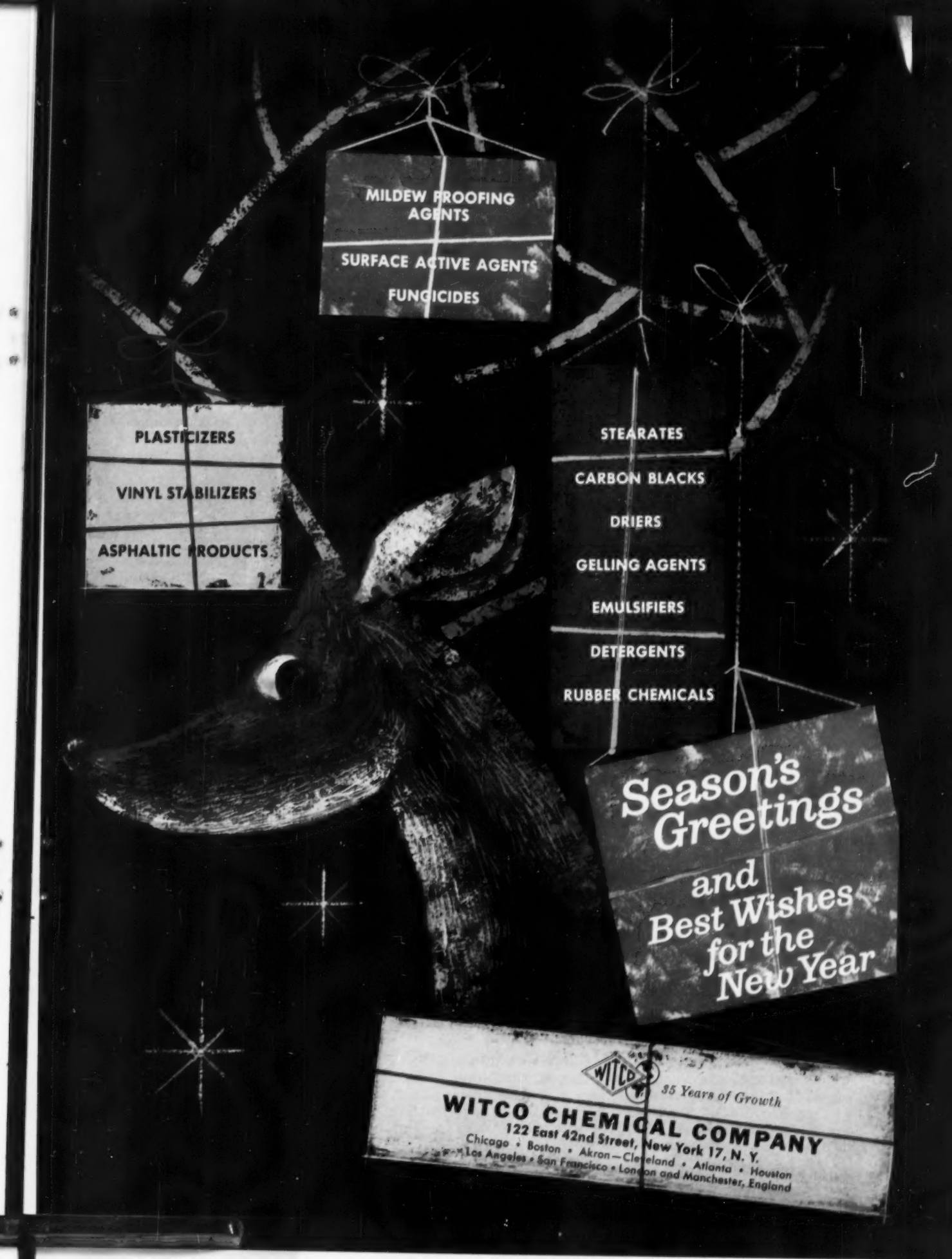
J. W. Criss has been named manager of special projects and will have his headquarters in New York City. He will supervise sales of ethyl acetate, acetic acid, and methyl acetate. **Charles A. Godsell** has been made sales representative and will cover the New England territory. **F. H. Hoyt** and **E. H. Finsilver** have been named sales representatives and jointly will be responsible for the New York office. **W. M. Young** will handle sales in Chicago, Ill., and **Leonard Roland** in Los Angeles, Calif. They will all report to **A. W. Dunning**, director of the newly formed Marketing Dept.

In the Springfield office, **W. K. Wilson** has been appointed manager of technical service; **D. H. Fraser**, manager of market research; and **J. A. Cooper**, assistant manager of product development.

The company now has sales offices in Springfield, Mass.; New York, N. Y.; Los Angeles, Calif.; and Chicago, Ill. These offices will service the major market areas for vinyl acetate resins and emulsions.

Minnesota Mining & Mfg. Co., St. Paul 6, Minn., announces that **Bertrand Y. Auger** has been appointed technical director of the reinforced plastics division and **Victor H. Colson** manager of technical service of the division. Mr. Auger will be responsible for research and market development of the company's new structural materials tradenamed Scotchply. Mr. Colson will handle customer service as well as market development of the new product.

Hercules Powder Co., Inc., Wilmington, Del., announces the following appointments: **Emmett E. Hixon**, formerly district manager for cellulose products in the Detroit, Mich., office, has been named manager of


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FUNGICIDES
PLASTICIZERS
VINYL STABILIZERS
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plastics sales of the company's Cellulose Products Dept. The sales and promotional activities for all plastics materials produced by the department will be consolidated under Mr. Hixon. **Roland S. Sawdey** succeeds Mr. Hixon as manager of the Detroit sales district office. **J. B. Martin**, former manager of Hercocel molding powder sales since 1952, will now supervise plastics promotion activities, and **L. T. Barnette** will continue to direct sales and development work connected with cellulose acetate flake.

Phillips Chemical Co., Bartlesville, Okla., a wholly owned subsidiary of **Phillips Petroleum Co.**, announces the following appointments in its new Plastics Sales Div.: **W. C. Douce**, **J. T. Roach**, **R. G. Askew**, and **C. R. Scott** have been named district managers for plastics sales offices to be established next spring in New York, Chicago, Los Angeles, and Boston. **W. R. Barrett** and **G. F. Blinzler** will become sales engineers for the Boston and Chicago district offices.

M. W. Davidson has been appointed supervisor of the sales service and development branch of the Plastics Sales Div.'s Bartlesville office and **L. B. Croley**, **J. V. Smith**, and **A. L. Walter** have been made sales service engineers in that branch.

Recent appointments in the new division were **George Wash**, director and sales manager; **Walter R. Clark**, assistant sales manager; **R. Vernon Jones**, manager of technical service and development; and **R. M. Wallace**, administrative assistant and coordinator.

Until the new district offices are established, the district managers and sales engineers will operate from the company's Bartlesville headquarters in establishing contacts with representatives of plastics products fabricators in their areas.

Carbide and Carbon Chemicals Co., a Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y., announces the following appointments: **D. B. Benedict**, formerly works manager, has been named a vice president of the company. He will be responsible for the firm's long-range planning in certain research and development activities, as well as all programs on synthetic fibers. **Gordon Ault** has been named assistant district manager of the San Francisco, Calif., office. **Robert E. Merrill** has been transferred to Carbide's Torrance, Calif., plant as area supervisor of polyethylene production.

Carbide also announces the opening of a new sales office at 233 St. Maurice Ave., New Orleans 17, La. **J. T. Fox** has been assigned to the office as technical representative. This is the 26th office established by Carbide and Carbon.

The Dow Chemical Co., Midland, Mich., announces that its New Orleans, La., office has been elevated to full sales office rank and **Robert J. Minbiole** has been appointed manager.

Canadian Resins and Chemicals, Ltd., Montreal 2, Que., announces the appointment of **Harrisons & Crosfield (Canada) Ltd.**, chemical distributors, as exclusive agents for sales of the company's industrial products throughout Western Canada. The products include C.R.C. polyvinyl acetate emulsions and resins, polyvinyl chloride resins, non-electrical extrusions, injection molded products, and plasticizers.

Canadian Resins has plants located at Shawinigan Falls and Ste. Therese, Que., as well as a district sales office in Toronto, Ont.

Farrel-Birmingham Co., Inc., Ansonia, Conn., announces that **Richard N. Comes**, formerly field sales engineer in New England, has been named sales manager of Banbury mixers. **Richard D. Mace** succeeds Mr. Comes as field sales engineer and will handle the sale of the company's line of plastics and rubber processing machinery in New England.

Auto-Vac Co., 1984 State St. Ext., Bridgeport, Conn., manufacturer of vacuum forming machines, reports that it was the only American manufacturer with an exhibit booth at the German Plastics Fair in Dusseldorf, Germany. Company representatives reported that Europeans seemed even more interested than Americans in vacuum forming primarily because it offers an economical medium for short runs.

Nassau Distributing Co., 1733 Broadway, New York 19, N. Y., is handling distribution of Auto-Vac machines in Europe.

Catalin Corp. of America and **Reichhold Chemicals, Inc.**, jointly announce that the boards of directors of both companies have authorized negotiations with respect to the possible merger of Reichhold into the Catalin organization under the name of Reichhold Catalin Chemicals, Inc. The transaction will be based on approximately three shares of Catalin common stock for one of Reichhold's. A substantial majority of this block of stock will be placed in a voting trust.

The General Industries Co.'s Plastics Div., Elyria, Ohio, announces that **Walter R. Kosy** has joined the staff of **C. H. Allin** who, along with **Ed Kerschen**, represents the company in Michigan. Mr. Kosy will have his headquarters at 628 Pallister Ave., Detroit 2, Mich. He was formerly a project engineer of Chrysler Corp. in Detroit for five years.

Thiokol Chemical Corp., Trenton 7, N. J., announces that **Eligio J. Caire** and **Eugene A. Krouse** have joined the company as technical staff representatives. Mr. Caire was formerly with the plastics division of Ciba Co., Inc. engaged in technical service involving the use of epoxy resins in industrial applications.

Federal Adhesives Corp., 210 Wythe Ave., Brooklyn, N. Y., has merged with **Imperial Adhesives Co. Alvin A. Edison** and **Jules S. Yurman**, formerly with Imperial, have joined Federal as sales executives.

Federal has just completed its first decade of operation in the adhesives industry. The company's affiliate is **Adex Mfg. Co.**, Baltimore, Md.

Resistoflex Corp., Belleville, N. J., announces the following appointments: **William Spangler** has been named head of a newly established Kansas City, Mo., sales office; **M. H. Eberle** has been appointed sales engineer at the Chicago, Ill., office; and

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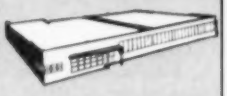
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R. A. Paulbach has been assigned to the West Coast sales staff and will make his headquarters in Burbank, Calif.

American Agile Corp., Maple Heights (Cleveland), Ohio, announces that **Hamilton Associates**, 453 N. Emerson Ave., Indianapolis, Ind., has been appointed as its representative in Indiana and northern Kentucky. The Hamilton firm is headed by **Byrl E. Hamilton. Walter J. Walsh** has been named Ohio sales representative.

United States Rubber Co. announces that the company has completed transfer of its plastics molding equipment from the Chicago Die Mold plant to the Fort Wayne, Ind., plant, where more adequate facilities to accommodate its molded plastics business are being made available. Operations at Chicago have been discontinued.

L.O.F. Glass Fibers Co., Toledo, Ohio, is building a new research center at Waterville, Ohio.

Dominick Labino, formerly vice president in charge of glass research and process development, has been appointed vice president and director of research.

National Rubber Machinery Co., 47 W. Exchange St., Akron 8, Ohio, has appointed **Robertson Co.**, Decatur, Ga., as its sales engineering service representative to handle NRM thermoplastic extruders and equipment in the southeastern states.

Rolls, Inc., 1240 E. 14th St., Brooklyn 30, N. Y., has been recently formed to produce custom-designed machinery and rebuilt equipment. Special engineering services, including plant layouts are also available.

Robert Tillis, president of Rolls, formerly directed engineering and manufacturing for the United Rubber Machinery Exchange, Newark, N. J.

A. Bamberger Corp. and **American Molding Powder & Chemical Corp.**, 703 Bedford Ave., Brooklyn 6, N. Y., has opened a new sales office and warehouse at 1750 W. Wrightwood Ave., Chicago 14, Ill. **Albert K. Speier**, formerly with the New York sales office, has been appointed Midwestern sales manager and will be assisted by **Justin Zenner. John H. Fox** will serve as office administrator.

Federal Tool Corp., 3600 W. Pratt Blvd., Chicago 45, Ill., announces the following appointments: **Elmer H. Burack** has been named production control manager and **Robert Williams** supervisor of quality control. Mr. Burack was formerly associated with Richardson Mfg. Co. and Mr. Williams with Continental Can Co. **George N. Hart** was recently named sales manager of Federal's Advertising Specialty Div. and **Robert A. Tucker** district sales manager.

Durable Formed Products, Inc. and **Blue River Plastics Mfg. Corp.**, 6 Greene St., New York 13, N. Y., announce the election of a new board of directors as follows: **Vito A. Tanzi**, chairman of the board and president; **Robert A. Gerardi**, vice president; and **E. Gilbert**, treasurer.

Owens-Corning Fiberglas Corp.'s Textile Products Div. announces that its Plastic Technical Sales Service Group and Plastics Products Development Group have been transferred from Newark, Ohio, to Ashton, R. I.

J. Poser & Co., 251 W. 30th St., New York 1, N. Y., has been recently formed and will engage in importing and exporting plastics raw materials, molds, machinery, and finished products. The firm will also function as an international agent and will take orders for molds which will be manufactured in Europe according to American design and specification.

Argus Chemical Corp., 633 Court St., Brooklyn 31, N. Y., announces the establishment of warehouse facilities in Akron, Ohio.

Plastic Art Decorating Co., formerly known as Modern Art Printing Co., is now located at 68 Freeman St., Brooklyn 22, N. Y.

L.O.F. Glass Fibers Co., Toledo, Ohio, announces that a new Market Research Dept. has been formed, with **Norman F. Heydinger** as manager. **William M. Temple** has been appointed manager of Government sales and **Claude F. Harr** has been assigned to the Sales Technical Service Dept. at the Toledo headquarters. **Richard H. Garnett** has been appointed New York field representative.

PERSONAL

Augustine R. Marusi, president of **The Borden Co.'s Chemical Div.**, has been elected a vice president of the company. He joined the division's research laboratory in Bainbridge, N. Y., in 1939 and subsequently served in various supervisory capacities before his election as president in March 1954.

Clifford Sizemore has been elected a vice president of **Pittsburgh Coke & Chemical Co.**, Pittsburgh, Pa. Mr. Sizemore, who joined the firm in 1929, will continue as plant manager and becomes the senior company executive at Pittsburgh Coke's Neville Island facilities.

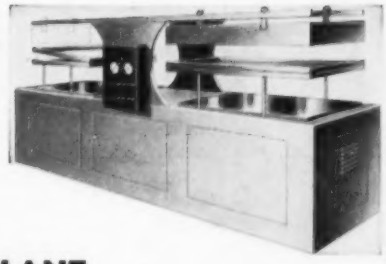
R. Arthur Gaiser, formerly of Libbey-Owens-Ford Glass Co., has been named director of research and product development of **Ball Brothers Co., Inc.**, Muncie, Ind. Mr. Gaiser will be in charge of research and product development in the fields of plastics, glass, metal, rubber, and paper products, the industries in which Ball is presently engaged in eight different plants.

Jack Craig, formerly New York representative of **Spencer Chemical Co.'s General Development Dept.**, has been appointed manager of market research, Industrial Chemicals. His headquarters will be at the general offices in Kansas City, Mo.

Harold J. Kolenski, formerly sales manager, has been elected a member of the board of directors and vice president in charge of sales of **Mastro Plastics Corp.**, 3040 Webster Ave., New York 67, N. Y. Mr. Kolenski joined the company in 1954 and has been responsible for developing national distribution of the company's line of polystyrene wall tile and acoustic ceiling tile.

John L. Sampson has been named a member of the board and vice president in charge of sales of **Wilson Plastics, Inc.**, Sandusky, Ohio. He will supervise the company's district sales managers and assume

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Versatile, easy to manufacture vinyl plastisols aren't limited to soft varieties. This remarkable hollow decoy is "living" proof! Made from Reslac High Durometer Plastisol, it is lightweight, unshatterable at extremely low temperatures, and will even withstand being bombarded by shotgun pellets and being run over by a car.

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THE PLASTISCOPE

responsibility for sales of Wilson's recently developed cement for plastic wall tiles, as well as its latest product, a complete underground sprinkling system for sale to the average home.

D. L. Matthews has been named chief engineer of **Goodrich-Gulf Chemicals, Inc.**, 4317 Chester Ave., Cleveland 3, Ohio. Mr. Matthews, former general manager of B. F. Goodrich Chemical Co.'s plant at Avon Lake, Ohio, returned to the United States from England where he supervised a plastics plant expansion for British Geon, Ltd., an affiliate of BFG Chemical Co. Goodrich-Gulf Chemical is a recently formed company engaged in the manufacture of Ameripol rubber at Port Neches, Texas.

Frank Sherry has been appointed plant manager of **Seiberling Rubber Co.'s Plastics Div.**, Newcomerstown, Ohio. He succeeds **C. F. Biggs,** who has returned to the company's main factory in Akron on special assignment in the office of the production superintendent. Mr. Sherry was formerly affiliated with B. F. Goodrich Co. as production manager of BFG's plastics products division in Marietta, Ohio.

John C. Hamilton has been named works manager of **Canadian Resins and Chemicals, Ltd.**, 600 Dorchester St., W., Montreal 2, Que. Mr. Hamilton joined the company in 1943.

A. J. Babineau has been appointed New England sales manager of **Jacobus Plastics, Inc.**, Jacobus, Pa. The company, equipped with presses up to 500 tons, is a compression molder concentrating on short runs.

Arthur J. McKeon, Jr., formerly sales manager of the Central Sales Div., is now sales manager of the Industrial Divs. of **Woodall Industries, Inc.**, 7565 E. McNichols Rd., Detroit 34, Mich. Mr. McKeon succeeds the late G. E. Kasch.

Craig C. Waldbillig has been appointed technical sales representative of **Nosco Plastics, Inc.**, Erie, Pa. He will cover Ohio, Indiana, and northern Kentucky from his headquarters at 1860 Milden Rd., Columbus, Ohio. Mr. Waldbillig was formerly associated with The Dow Chemical Co. where he held a similar position.

Carl A. Drake has been appointed manager of the Manufacturing Engineering Unit of **General Electric Co.'s** Laminated and Insulating Products Dept. at Coshocton, Ohio. Mr. Drake joined the company's Turbine Dept. in Lynn, Mass., in 1940 and was transferred to Coshocton in 1946 where he has held various supervisory positions in both engineering and manufacturing.

Alexander R. Macdonald, formerly manager of the New York office, is now assistant manager of **The National Plastic Products Co.**, Odenton, Md. In his new assignment he will be primarily concerned with plant operations—plant production, sales, and personnel relations.

R. W. Marsh has been appointed direct factory representative of the plastic press division of **Baker Brothers, Inc.,** Toledo 10, Ohio, and will cover the eastern territory. Mr. Marsh was formerly sales representative for The Borden Chemical Co. and Durez Plastics & Chemicals, Inc.

Herbert R. Helbig has been named manager of the Export Div., of **Reichhold Chemicals, Inc.**, White Plains, N. Y. He joined the company in 1945 and has been product sales manager since September 1954; prior to that appointment, Mr. Helbig managed RCI's Atlantic Div. in Charlotte, N. C., where he built the firm's plant and was in complete charge of manufacture and sales of urea resins.

William J. Fath has been named production control manager of The **Hydraulic Press Mfg. Co.**, Mount Gilead, Ohio.

Lynn C. Edgar has been appointed sales manager of **Tube-Kote, Inc.**, Houston 25, Texas.

Robert L. Spitzer has been appointed general manager of the injection molding department of **Fortune Laboratories, Inc.**, 1405 Main St., Des Moines, Ia. Mr. Spitzer was formerly associated with General Electric Co., Decatur, Ill., as supervisor of a 23-machine injection molding shop.

Paul Bogner has been assigned to the Chicago district sales office of **Emery Industries Inc.**, Carew Tower, Cincinnati 2, Ohio. Mr. Bogner will handle sales of the company's products in Minnesota, Wisconsin, northern half of Iowa, northern Illinois, and part of metropolitan Chicago.

Kenneth R. MacCowan has joined **Consoweld Corp.**, Wisconsin Rapids, Wis., as assistant to the advertising and sales promotion manager.

James F. Herslow, formerly sales manager, has been appointed vice president of **The Sillcocks-Miller Co.**, Maplewood, N. J. Mr. Herslow was formerly with the New York office of Esso Standard Oil Co.

Albert Spaak has joined **Mastro Plastics Corp.**, 3040 Webster Ave., New York 67, N. Y., as chief engineer. He was formerly associated with De Mattia Machine & Tool Co., Clifton, N. J.

Paul R. Langevin has been appointed advertising manager of **Gering Products, Inc.**, Kenilworth, N. J. He was formerly with Bolta Products, Div. of The General Tire & Rubber Co.

J. L. Lane has been named assistant general manager of The **Visking Corp.'s** International Div., 6733 W. 65th St., Chicago, Ill. He joined the company in 1933 and was formerly sales manager of Visking, Ltd., Lindsay, Ont.

E. J. Van Dyck, formerly sales manager of Textiglass Div. of Cheney Bros., has been appointed sales manager of the Aircraft Div. of **U. S. Polymeric Chemicals, Inc.**, Stamford, Conn. The company is engaged in the pre-impregnation of fibrous glass fabrics and mats with all types of thermosetting resins.

Carl R. Liddane has been named sales engineer of **Bradley Container Corp.**, Maynard, Mass. He will service Bracon customers in the New York area.

Robert W. Matlock, formerly technical representative, has been appointed chief engineer of Zenith Aircraft, Div. of **Zenith Plastics Co.**,

(*To page* 266)

Now you can create alloys for uses like



Special Industrial Finishes, such as the tough enamel lining of this Airslide car for shipping flour, are made possible by new Versamid-epoxy alloys. By blending these resins, you can get hard, tenacious finishes with outstanding resistance to moisture and many solvents, as well as alkaline solutions of up to 50% concentration. For more data on the properties of these alloys, Write for General Mills Technical Bulletin 11-D.



Bubble-Free Pottings and castings can be made with Versamid 125 and epoxy resin alloys. They offer lasting toughness and resistance to water, chemicals and most solvents. This resin alloy features low shrinkage, excellent thermal shock resistance, high physical and dielectric strength and freedom from noxious curing agents. Write for new bulletin.



Low-Cost Tools and Dies like these are now being made from thermosetting blends of Versamid and epoxy resin by Champion Aircraft Corporation, St. Paul, Minn. Versamid-epoxy alloys are hard, tough, impact-resistant—excellent for tools, jigs, fixtures, master molds and like items. With low shrinkage, they conform to the mold, give amber-clear, bubble-free castings, saving time and money for Champion and many other companies.



For more information, send for the new booklet, "Versamids . . . A Demonstration in Resin Versatility."

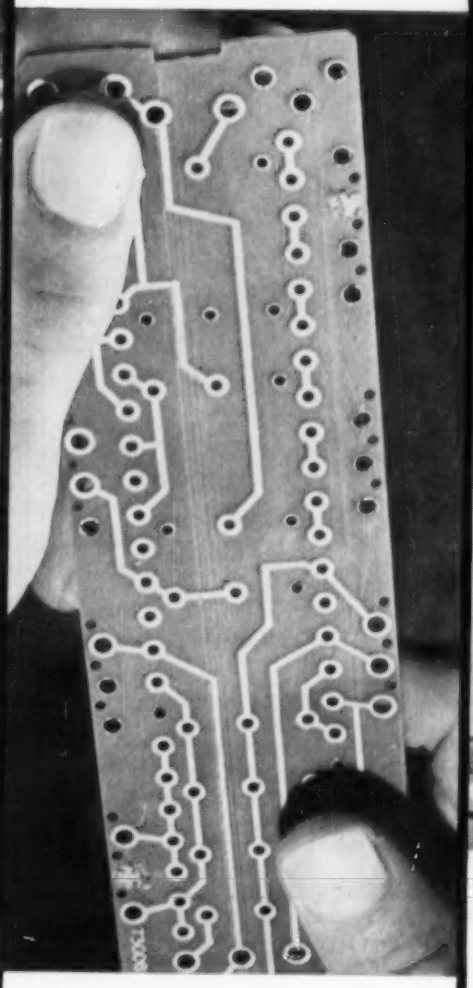
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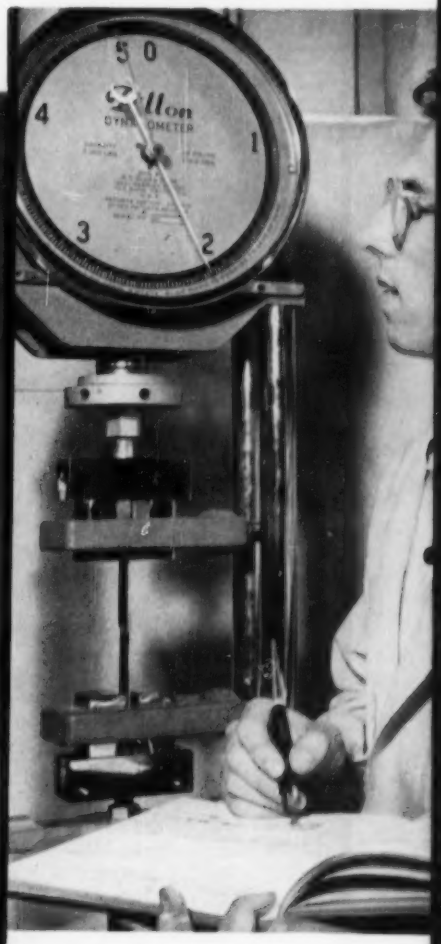
exciting new resin these with Versamids!*



Rugged Laminations, such as the plastic boat above, are among the uses for Versamid-epoxy resin alloys. These blends laminate glass fiber cloth, mat or roving. They wet the glass thoroughly, resist delamination. Other possible uses include plastic pipe, radome materials, honeycomb panels and air frame components for aircraft.



Printed Circuit Bases like this are a new use for Versamid 115-epoxy resin blends. Toughness, adhesion, and resistance to corrosion make them ideal for this purpose. Another blend (Versamid 100 and epoxy) bonds electrolytic metals to the bases—with contact pressure only. Formulations appear in Technical Bulletin 11-E.



Load Bearing Adhesives much stronger than most commercial adhesives are made from thermosetting blends of Versamid 115 and epoxy resins. They bond almost any substrate to any other... including wood, steel, aluminum alloys, sheet glass, Plexiglas, Mylar and honeycomb core materials. They show top shock resistance and offer protection against water, grease and oil, chemicals and common solvents. Write for Technical Bulletin 11-F.

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THE PLASTISCOPE

Gardena, Calif. Mr. Matlock will be responsible for the execution of engineering services offered by the company in the manufacture of reinforced plastics components for the aircraft and missile industry.

G. Gordon Schmuck has been named West Coast representative of **Kaykor Industries Div., Kaye-Tex Mfg. Corp.**, Yardville, N. J. His headquarters will be at 1335 Yukon Way, Novato, Calif.

James C. Hood, Jr. has been assigned to the engineering staff of **Molded Fiber Glass Tray Co.'s** Development and Design Div., Linesville, Pa., producer of fibrous glass-reinforced trays and tote boxes.

Dr. Edward M. Peters has joined **Cadet Chemical Co.**, Burt, N. Y., as assistant laboratory director. He was formerly associated with Upson Co.

John W. Church has been named vice president in charge of research and development of **Mastic Tile Corp. of America**, 99 Park Ave., New York, N. Y.

Aldo S. Pero has been named vice president of **Fluid Chemical Co., Inc.**, Newark, N. J., contract packagers of aerosols and other types of containers. Mr. Pero's previous experience included service with Precision Extruders and Shaw Insulator Co.

Deceased

Peter De Mattia, president of De Mattia Machine & Tool Co., Chelsea Rd., Clifton, N. J. died on October 23 after a short illness.

MEETINGS

Plastics Groups

Nov. 29—The Society of the Plastics Industry, Inc., Sheet Fabricators and Formers Conference, Hotel Cleveland, Cleveland, Ohio.

Dec. 6-7—The Society of the Plastics Industry Inc., Sixth S.P.I. Film, Sheeting and Coated Fabrics Division Conferences, Hotel Commodore, New York, N. Y.

Dec. 10—Society of Plastics Engineers, Inc., Meeting, Worwas, Minneapolis, Minn. D. E. Nelson, Sales Engineer of Reinforced Plastics Div.,

Minnesota Mining & Mfg. Co., will address the Upper Midwest Section on the subject of "Scotchply Reinforced Plastic."

Jan. 18-20, 1956—Society of Plastics Engineers, Inc., Twelfth Annual National Technical Conference, Statler Hotel, Cleveland, Ohio.

Feb. 7-9—The Society of the Plastics Industry, Inc., Eleventh Annual S.P.I. Reinforced Plastics Division Conference, to be held at Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.

March 8-9—The Society of the Plastics Industry Canada, Inc., Fourteenth Annual S.P.I. Canadian Conference, Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada.

March 27—The Society of the Plastics Industry, Inc., Pacific Coast Section, Annual Meeting, San Francisco, Calif. Other Meeting Aboard Ship, March 28 to April 2.

June 11-15—The Society of the Plastics Industry, Inc., Seventh National Plastics Exposition, New Coliseum, New York, N. Y.

Other Meetings

Dec. 5-9—International Exposition Co., New York, N. Y., Twenty-fifth Exposition of Chemical Industries, Commercial Museum and Convention Hall, Philadelphia, Pa.

Dec. 6-8—Signal Corps Engineering Laboratories and the Wire and Cable Industry, Fourth Annual Symposium on "Technical Progress in Communication Wire and Cables," Berkeley-Carteret Hotel, Asbury Park, N. J.

Jan. 15-17, 1956—National Association of Auto Trim Shops, Inc., Auto Trim Show, Hotel Statler, New York, N. Y.

Jan. 19-26—National Housewares Manufacturers Association, Twenty-fourth National Housewares Manufacturers Exhibit, Navy Pier and Drill Hall, Chicago, Ill.

Feb. 22-March 2—British Industrial Fair Ltd., British Fair, Earls Court, London, England.

Feb. 26-29—American Institute of Chemical Engineers, Meeting, Statler Hotel, Los Angeles, Calif.

Feb. 27-March 2—American Society for Testing Materials, National Meeting, Hotel Statler, Buffalo, N. Y.



"...and to Charlie, my favorite nephew, I bequeath all my **plastics scrap**—worth a fortune at A. Bamberger's."

Uncle Phisby knew that plastic scrap is worth a sock full of cash at A. Bamberger's. Somewhere in *your* plant you have the same kind of treasure . . . surplus virgin inventory, off-color molding powder, obsolete parts . . . scrap that's idling and eating up space. Turn it into cash. Call us in. Write, phone or wire. Send samples, or let us inspect. You'll get top prices. And want to save money on purchasing? Try us for reprocessed and virgin plastics of guaranteed quality.

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SAVE WITH GUARANTEED REBUILT EQUIPMENT: HYDRAULIC PRESSES; compression molding Dunning & Boschert 2—12" ram 170 ton, 2—16" rams 115 ton—Baldwin Southwark 4—26"x26" 8" ram, 75 tons; 5—26" x26" 7" ram 57.7 tons; 5—15"x15" 8" ram, 75 tons; 4—14"x14" 8" ram, 75 tons; 2—19"x24" 10" ram, 75 tons; 18"x18" 7" ram, 57.7 tons; 3—12"x12" 7¼" ram, 66 tons; 8"x9" 4½" ram, 20 tons; D&B 12"x12" 3" ram, 10 tons: LABORATORY PRESSES: Carver 6"x6" 10 ton, W&S 6"x6" 20 tons; Preform Presses 5½T Colton and Stokes R, M.D.; NEW UNIVERSAL DUAL PUMPING UNITS, 3-15 HP; NEW LABORATORY MILLS AND CALENDERS, also extruders, mixers, vulcanizers, injection molding units, etc. UNIVERSAL HYDRAULIC MACHINERY CO. INC., 285 Hudson Street, New York 13, N. Y.

FOR SALE: Embossing Machine for Plastic film, light or heavy gauge. Will Emboss, laminate & polish 8 preheating rolls, electric controlled, Teflon covered, 64" face, with dual let off and dual friction clutch take up, air guides & baloney roll. Can be seen in operation. T & M MACHINE & TOOL CO., 15-17 Greenpoint Ave., Brooklyn 22. New York, Tel.: EV 9-1964.

FOR SALE: (11) 75 ton record presses, complete @ $2,450, (11) new 100 ton, 10" ram, 10" stroke @ $1,100, (8) 200 ton, 9" stroke, 14" ram, 36x36 @ $1,850, (7) 200 ton, 9" stroke, 15" ram, 30x30 @ $1,650, (1) 50 ton complete, 18x18 @ $1,850, (1) 200 ton, 16" ram, 36x36 @ $2,450, (2) 200 ton, 16" ram, 42x42 @ $2,850, (1) 200 ton, 15" ram, 42x42 @ $2,450, (4) 250 ton, (2) 12" rams, 30x60 rebuilt @ $5,375. HYDRAULIC SAL-PRESS CO., INC., 388 Warren Street, B'klyn, N. Y.

FOR SALE: 1—Royle #4 Extruder, motor driven; 1—6"x12" Laboratory Mill, m.d.; 1—Ball & Jewell Rotary Cutter, size O m.d.; 2—Baker-Perkins Size 15, 100 gal. Jacketed Mixers; 5—Horizontal Dry Powder ribbon Mixers, 4000#, 1500#, 500#; 1—New 3 Roll 6"x16" Laboratory Calender; 1—Farrell-Birmingham 60" Mill with reduction drive, 150 HP motor, floor level mounting; 1—Fitzpatrick "D" Comminutor, S.S. contact parts, jacketed; 1—Mikro Pulverizer #2th, with motor; 4—Reed Prentice & W-S Injection Molding Machines, 2-16 oz.; Also other sizes: Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. Send us your inquiries. What have you for sale? CONSOLIDATED PRODUCTS CO., INC., 58 Bloomfield Street, Hoboken, N.J. HOboken 3-4425, N.Y. Tel.: BArclay 7-0600.

FOR SALE: Stainless Steel Rotary Dryer, Link Belt Co., 5'2"x16". No. 502-16, with all auxiliary equipment. Roto louvre also 6'x24' and 5'x26'. Hersey Stainless Steel Rotary Driers. Reply Box 3006, Modern Plastics.

FOR SALE: Injection Molding Machines, 16 oz. H.P.M. Late type machines, 9 oz. H.P.M., 8 oz. W. & S., 4 oz. De Mattia. Mod. 252 Stokes closure press, Ball & Jewell plastic grinders. AARON MACHINERY CO., INC., 45 Crosby Street, New York 12, N. Y.

FOR SALE: 3—Ball & Jewell #2, #1½ Rotary Cutters; 1—Cumberland #0 Rotary Cutter; 4—Two Roll Mills 20"x22"x40", 15"x40", 6"x14"; 3—Baker Perkins 100 gal. 50 gal., 2 gal., jacketed double arm Mixers; 1—Stokes Rotary Preform Press #DD82 NEW; 2—Stokes Model "R" single punch Preform Presses NEW; 1—Kux Model 15-25 Rotary Press; Also: Sifters, Banbury Mixers, Powder Mixers, etc., partial listing; write for details; we purchase your surplus equipment; BRILL EQUIPMENT CO., 2407 Third Ave., New York 51, N. Y.

BUTTONDEX MACHINES: Slightly used machines for sale at bargain prices. Reply Box 3001, Modern Plastics.

FOR SALE
8—10 oz. DeMattia vertical injection machine. Has less than 1000 hours production time. 2 years old. Has defective casting which leaks—manufacturer's warranty unsatisfactory. Will sell as is for value of pumps, valves and electrical parts. Ideal for a shop with repair facilities and lots of patience. Reply Box 3025, Modern Plastics.

BANBURY Size B Lab Mixer, Thropp 3"x8" Lab Mill, Stokes 150 ton semi-autom. hydr. Press. Kux 2½" dia. single punch Preform Machine, Leominster 8 oz. Injection Molding Machine, Farrell 15"x36" 2 roll Mill. Mills and Calenders up to 84". New Seco 6"x12" and 6"x16" Lab. Mixing Mills and Calenders. Plastic & Rubber Extruders. Brunswick 200 ton 21"x21" platens. Bolling 150 ton 20"x20" platens. French Oil 8 opening 315 ton 42"x42". Wat.-Stillman 75 ton automatic Molding Press 20"x20" platens. 200 ton Hobbing Press 15"x14" platens. HPM 200 ton 30"x48" platens. New Loomis 340 ton, 24"x56" platens. Robertson 150 ton, 24"x24" platens. Adamson 100 ton, 20"x20" platens. Farrel 200 ton 20"x80" platens. Southwark 30 ton 14"x14" platens, semi-auto. Also Lab to 2000 tons from 12"x12" to 48"x48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump 250#. W.S. 4 Plgr. High and Low Pressure Hydr. Pump. Elmes Hor. 4 Plgr. 4500 lbs. and 5500 lbs. Hydr. Pumps, Accumulators. Stokes Automatic Molding Presses. Rotary & single Punch Preform Machines ½" to 4". Injection Molding Machines 1 oz. to 60 oz. Baker Perkins Jacketed Mixers. Plastic Grinders. Heavy duty mixers, gas boilers. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107 8th Street, Brooklyn 15, N. Y. STerling 8-1944.

FOR SALE: 200 T. HPM Fastraverse Fiberglass press 84"x60" pl. Williams & Turner Preformers.—Injection Presses: 4, 8, 12, 24 oz. Reeds; 2, 9, 60 oz. HPM; 32 oz. Vertical HPM; 8, 12, 20 oz. Lesters; 12 oz. 48 oz. Watson; 1, 2, oz. VanDorn; 4 oz. Lewis. Extruder: Stokes-Windsor RC 65 Twin-Screw—Cumberland 0 & 1 Granulator—Ovens—Merid. Temp. Circulator—Cumberland 7" Stair-Step Dicing mach—48" Stokes Vac. Metallix. Set-up—6"x12" Lab. Mill—Compression Presses: 50 to 600 tons. 50 T. & 150 T. Stokes Standard Presses. 15 T. Stokes Automatics—Stokes No. 294 & Kux No. 60 Preform presses—30 HP Oilboiler—Auto-Vac Vac. Forming Mach. 52"x 30". Abbott Vac. Form. Mach. 36"x36". 200 T. Hobbing press—24 & 16 Carrier Braiding Mach. —All Midwest locations. List your Surplus Equip. with me. JUSTIN ZENNER, 823 W. Waveland Ave., Chicago 13, Ill.

FOR SALE: Take-up equipment for layflat polyethylene tubing. Will handle 60 inch wide layflat. Also, 8 inch tubing die for 3½" Hartig extruder. Good condition. Available immediately. Reply Box 3047, Modern Plastics.

VICKERS HYDRAULIC PUMP: Type A. Size 1.65 1200 RPM w/induction motor, 10 HP. w/hyd. oil reservoir size 13"x17½"x17". AVAILABLE: All types of used and resale plastic machinery. EVEREADY, 805 Housatonic Ave., Bridgeport, Conn. EDison 4-9471-2.

FOR SALE: Welding Engineers Dual Plastic Extruder 2½" dia. 20 HP motor used for extruding Polyethylene and Vinyl to be cut into molding pellets—10 years old, $2100. #3 Royle Extruder 4½" dia. screw used for cellulose nitrate, $2200. Size 1½ Cumberland Granulator with 10 HP motor. All machines good condition. Reply Box 3045, Modern Plastics.

FOR SALE: 1 National Erie 8½" strainer, 1 R. D. Wood 30 ton self-contained molding press, 1 Stokes Windsor R C 200 triple screw extruder, 2 800 ton self-contained compression molding presses, 1 NRM 1" electric extruder. Mills, mixers, choppers, etc. CHEMICAL & PROCESS MACHINERY CORP., 146 Grand St., New York 13, N. Y.

FOR SALE: (6) 4 oz. Lesters, 1953, fully automatic; large machines, 32 to 60 oz.; 24 oz. Reed-Prentice, 1950, $17,500; 22 oz. Impco w/transfer plunger; 16 oz. H.P.M., $9,000; 16 oz. Watson-Stillman, $9,000; 12 oz. Impco vert., $8,000; 12 oz. DeMattia, 1952, $10,500; 12 oz. Reed-Prentice, 1952, $14,500; 12 oz. Lester, $7,500; 9 oz. H.P.M., 1946, $5,500; 9 oz. H.P.M., 1943, $4,000; 8 oz. Reed-Prentice, 1946, $6,500; 8 oz. Reed-Prentice, 1948, w/plunger advance, $7,500; 8 oz. Lester, 1950, $7,750; 6 oz. Lester, Model L-1½; 6 oz. Hisgen, $1,850; 4 oz. Impcos w/larger cyl. $5,500; 4 oz. Lewis, 1953, $5,000; 4 oz. Crown, 1950, $3,250; 4 oz. Lester vert., $4,500; 12 oz. Lester, Model L2½, $11,000; 8 oz. Leominster, $4,000; 8 oz. Reed-Prentice, $4,000; 4 oz. Lester, $3,250; 3 oz. Fellows, $6,500; 3" Hartig extruder, oil heated, $1250; 2 oz. Moslos, 1954; Stokes presses, compression, transfer & preform; all types used plastic equipment. ACME MACHINERY & MFG. CO., 102 Grove Street, Worcester, Mass.

FOR SALE: (2) 300 Ton W.S. Presses 20x20 & 29x24 Platens. 140 Ton W.S. 22x16 Platen. 85 Ton Waterbury Farrel 20x24 Platen. 63 Ton Press 15x15 Platen with Pullback Cyls. 9, 8, 4, Oz. Injection Molding Machines. 15 Ton Lab. Presses 10x8 Platen. 10 Ton Lab. Presses 6x6 Platen Ball & Jewell Plastic Grinders. Standard Mystic Embossing Presses, Accumulators, Pumps, Valves. No. 252 Stokes Closure Press, 250 Ton W&S 28x24 Platens. 80 Ton Farrel 24x24 Platens. Many other Presses—Send for Bulletin. AARON MACHINERY CO., INC., 45 Crosby St., New York 12, N.Y. Tel.: WAlker 5-8300.

FOR SALE: Heavy Duty Double Arm Sigma Blade Mixers. (4) Readco 50 gal. 30 HP; (2) W & P 100 gal; (1) Day 30 gal. (2) Kux Rotary Pellet Presses. (4) Sprout-Waldron Horizontal Ribbon Mixers 336 cu. ft. (12,000#) capacity. (1) 1300 gal. T316 St. Kettle, jacketed 25# atmospheric internal paddle agitator. (1) 25 gal. T347 St. Kettle 550# Int. Press., 150# jkt. press. with agit. PERRY EQUIP. CORP., 1429 N. 6th St., Phila. 22, Pa.

HYDRAULIC PRESSES: Elmes 1000 Ton Hobbing Press, MD Pump. Baldwin-Southwark 3600 Ton Belt Press. HPM 750 Ton, Self-Contained. Watson-Stillman 600 Ton Hobbing Press, MD Pump. Lake Erie 215 Ton Self-Contained, Semi-Automatic. Watson-Stillman and HPM 100 Ton, Burroughs 75 Ton Electrically Heated. HPM 35 Ton Molding Presses. Watson-Stillman and Elmes 30 and 20 Ton Lab Presses. Stokes Model 200D-3 Automatic and 200 Ton, 150 Ton and 100 Ton Semi-Automatic Presses. INJECTION MACHINES: Impco VF-822 and VF-822A, 350 Tons Clamp. HPM Model 200-H-9, 9 oz., 200 Tons Clamp. HPM Model 250-H-16, 16 oz., 350 Tons Clamp. Reed-Prentice 12 oz., 1952 Machine. Reed-Prentice and Watson-Stillman 2 oz. Van Dorn Model H-200, 1 oz. (2). TABLET MACHINES: Stokes S-5, R, T and RDS-3 and Colton #5, 5½ and 2RP. MILLS: 4—Farrell 18"x50", 250 HP Speed Reducer. Available as a Mill Line or Individual Units. 4—Farrell 16"x40", 150 HP Motor and Speed Reducer. EXTRUDERS: 6" Royle #4, 6" Allen-Williams "Rapido," 4½" Hartig, 3½" Hartig, 2" Royle #1, All Individual Motor Drive. MIXERS: Banbury #1, Completely Chrome Plated Interior for Plastics. 50 HP Motor Drive, Oil Heating System, All Controls. Baker-Perkins, Jacketed, 2½ Gallons, Gear-Motor Drive. MISCELLANEOUS: Vulcanizers, Calenders, Grinders, Pumps, Valves, Platens, Etc. JOHNSON MACHINERY COMPANY, 683-P Frelinghuysen Avenue, Newark 5, New Jersey. Bigelow 8-2500. WHAT HAVE YOU FOR SALE? WHAT ARE YOU LOOKING FOR?

(*Continued on page 270*)

FIBERGLAS
Reinforced
MOLDING COMPOUNDS

ALL THE PROPERTIES OF PLASTICS... PLUS!

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- **Dimensional Stability**



Stronger than steel... with the hickory feel

A revolutionary new hammer handle . . . illustrating how easy it is for design imagination to use the unique properties of Fiberglas-reinforced plastic to create a dramatic new product application . . . plus a powerful new *selling story*.

Fiberglas-reinforced plastics offer three big "extras"—higher strengths, improved dimensional stability, and greater heat resistance.

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Besides obvious benefits of strength and lightness —markedly superior to conventional steel or hickory—Fiberglas-reinforced plastic has created a hammer handle that is unbreakable, won't bend or split, swell or shrink, rust or rot . . . invaluable selling features in the highly competitive hand tool field.

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Fayette R. Plumb, Inc., Philadelphia, Pa.

MOLDER:
Molded Insulation Products, Philadelphia, Pa.

MOLDING COMPOUND:
Fiberglas-reinforced polyester by Plumb Chemical Corp., Philadelphia, Pa.

write to OWENS-CORNING FIBERGLAS *Dept. 125-L, Textile Products Division, 598 Madison Ave., N. Y. 22, N. Y., for full list of suppliers*

T. M. Reg. Owens-Corning Fiberglas Corp.

CLASSIFIED ADVERTISING

(*Continued from page 268*)

AVAILABLE AT BARGAIN PRICES
Mitts & Merrill 15 CD Rotary Cutter. J. H. Day, from ¾ up to 100 gal., Imperial and Cincinnatus D. A. Jacketed, Sigma Blade Mixers. Day 15 to 10,000 lbs. Dry Powder Mixers. Baker Perkins Heavy Duty (Steam Jacketed) Double Arm, from 5 to 200 gal., Mixers (Unidor and Vacuum also). Gemco 2000 lbs. 54 cu. ft. Double Cone Blender. Mikro Bantam, 1SH, 1F, 2TH Pulverizers. Day, Roten, Tyler Hum-mer, Robinson, Raymond, Gayco, Great Western Sifters. Colton 2RP and 3RP Rotary Tablet Machines. Carver Laborntory 20 ton hydraulic Press. Package Machy. FA, FA2, FA4, Miller, Hayssen, Wrap-King, Scandia, Hudson Sharp, Oliver Auto. Wrappers—all sizes. This is only a partial list. Over 5000 machines in stock available for immediate delivery. Tell us your machinery requirements.
UNION STANDARD EQUIPMENT CO.
318-322 Lafayette St.
New York 12, N. Y.

MACHINERY and EQUIPMENT WANTED

WANTED: Two used RC-100 Extruders. Reply Box 3057, Modern Plastics.

PLASTIC DRYING OVEN WANTED
Tray type, circulating air, electrically heated. At least 100 lb. per hr. capacity. Reply Box 3002, Modern Plastics.

WANTED: 2-Roll Laboratory Mill: 6x12, steel rolls, for plastics, Good lubrication preferred. Must be in topnotch condition. Indicate manufacturer's model number in your reply. Reply Box 3010, Modern Plastics.

WANTED: 2—16-oz. Watson Stillman Injection Molding machines. 3—8-oz. Reed Prentice Injection Molding Machines. 1—12-oz. Watson Stillman Injection Molding machine. EVEREADY, 803-5 Housatonic Ave., Bridgeport 4, Conn.

INTERESTED PURCHASING late type eight and twelve ounce Lesters and eight and nine ounce HPM or Watson Stillman Injection Machines. Reply Box 3018, Modern Plastics.

WANTED: One Hydraulic press, 24x54 with 6 to 10 openings, 500 to 1000 Lb. pressure per sq. in. complete with pumping equipment for press polishing of plastic—state condition and price—also interested in complete press polishing setup. Reply Box 3023, Modern Plastics.

WANTED: Resin Kettles, stainless steel or glass lined, from pilot plant up to 2000 gal. sizes. Also Rotary Pellet Presses; B & J cutters; Mikro Pulverizers; etc. Send us your list of surplus equipment. PERRY EQUIPMENT CORP., 1429 N. 6th St., Phila. 22, Pa.

DESIRE TO PURCHASE, USED
One (1) 200 or 300 Ton self-contained transfer press—50 Ton transfer ram, minimum. One (1) Single stroke preformer approximately 30 Ton. One (1) preheater 3-5 KW approximately 14"x20" plate area. Reply Box 3016, Modern Plastics.

VACUUM METALLIZER: State size, make, serial No. and price. We are also interested in auxiliary metallizing equipment. Reply Box 3011, Modern Plastics.

WANTED: Compression Molding Presses, all types. Reply Box 3020, Modern Plastics.

WANTED TO PURCHASE: 2½" vinyl extruder in good operating condition, completely equipped for immediate delivery. State type, brand and all pertinent details, indicating, too, if cross head is available. Reply Box 3050, Modern Plastics.

MATERIALS FOR SALE

FOR SALE
10,000 lbs. Bright Red Virgin Tenite I.
10,000 lbs. Bright Blue Virgin Tenite I.
5,000 lbs. Virgin Dow 475 Chartreuse.
15,000 lbs. Red Reprocessed Polystyrene High Impact. 8,000 lbs. Green and Blue Reprocessed Polystyrene High Impact. 10,000 lbs. Yellow Reprocessed Polystyrene High Impact. 10,000 lbs. each, Red, Green, Yellow Reprocessed Polystyrene. 15,000 lbs. Natural A-1 Reprocessed Polyethylene. 30,000 lbs. Reprocessed Black Polyethylene. 50,000 lbs. Transparent Red Methyl Methacrylate taillight formulation. Samples and prices on request.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.
Telephone MAin 5-7450

FOR SALE: 20,000 lbs. each Red and Blue Styrene Pellets. Surplus lot Red Acetate Pellets—15,000 lbs. Both attractively priced. We are also in the market for all surplus plastic scrap and powder. PLASTIC MOLDING POWDERS, INC., 2004 MacDonald Avenue, Bklyn., N. Y. Tel.: ES 5-7943.

PLASTICIZERS: 20,000 lbs. DIOP prime quality in drums, very low price. Also Dibutyl, Dicapryl, Dimethyl Phthalates. Let us know your requirements. CHEMICAL AFFILIATES, INC., 274 Madison Ave., New York 16, N. Y. Tel.: MU 3-4731.

FOR SALE: Fiberglass Mat ends, cut-offs, scraps, damaged rolls. Approx. 5,000 lbs., mixed. Also 8 rolls 1-mil Polyvinyl acetate film. STRICK PLASTICS CORP., Perkasie, Pennsylvania.

INVENTORY CLOSEOUT AT DISCOUNT: 10,000 lbs. Diethyl Phthalate, original packing; Arochlor 1242-low priced, good extender for Vinyls, Chlorinated Rubber; Acetyl Triethyl Citrate, excellent primary and/or secondary plasticizer for Vinyls and Celluiose Acetate. ACETO CHEMICAL CO., INC., Flushing 54, N. Y. INdependence 1-4100.

FOR SALE: 35,000# Black, 20,000# Silver, 25,000# Brown, 5/10,000# each Bright Toy Colors, 15,000# No. 1 Natural, all REPROCESSED POLYETHYLENE PELLETS; Also 1800# Standard Royal Blue, 1100# Standard White, All Virgin Styrene. ERIE PLASTICS COMPANY, Buffalo Rd. & Warfel Ave., Erie, Penna. Tel.: 2-2503.

MATERIALS WANTED

WANTED
Plastics Scrap and Rejects of all kinds, ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.
MAin 5-7450

SCRAP PLASTICS: All forms, waste and surplus plastic molding materials, rejects in any form. We will also buy your obsolete inventories of molding powders, stabilizers, plasticizers and other plastic and chemical materials. ACETO CHEMICAL CO., INC., 40-40A Lawrence St., Flushing 54, N. Y. INdependence 1-4100.

WANTED: PLASTIC SCRAP. Polyethylene, Polystyrene, Acetate, Acrylic, Butyrate, Nylon, Vinyl. GEORGE WOLOCH, INC., 601 West 26th Street, New York 1, N. Y.

WANTED: Plexiglas and Lucite scrap, salvage and cut-offs, any quantity. DUKE PLASTICS CORP., 584 Broadway, Brooklyn 6, N. Y. Tel.: EVergreen 8-5520. Note new address!

WANTED: Polystyrene: virgin, off color, clean reground, or reprocessed, all colors. End users. STERLING PLASTICS CO., 1140 Commerce Ave., Union, New Jersey.

MOLDS FOR SALE

FOR SALE: Six sizes, 8 cavities, interchangeable women's glass heel molds. Reasonable. Send for samples and further information. Reply Box 3060, Modern Plastics.

FOR SALE: One undergated 6 cavity 4¼"x 4¼" plastic wall tile mold. One undergated 8 cavity combination half and feature tile mold. Modern bevel excellent contour. These molds are in excellent condition. An outstanding opportunity for someone in the wall tile mfg. field. No reasonable offer refused. Reply Box 3022, Modern Plastics.

FOR SALE: Small attachment plug, large cavity compression molds, in perfect molding condition for large production. Reply Box 3056, Modern Plastics.

PLANTS FOR SALE

FOR SALE: Injection Molding Plant in the Midwest area making over $100,000.00 per year. 12 Molding machines and complete Toolroom. Reply Box 3013, Modern Plastics

HELP WANTED

ENGINEER, PLASTICS: We are expanding pilot plant for new product development and need competent, experienced extrusion engineer. Experienced in extrusion and problems of various thermoplastics and capable of bringing new techniques from experimental to production stage. Graduate ME desirable but not determining factor. Capable of growth to larger responsibilities. Eastern location. Your reply should state full qualifications. Reply Box 3043, Modern Plastics.

MATERIAL SALESMEN
We have openings for experienced plastics materials salesmen in several territories. Activities include sale of Virgin and Reprocessed molding powders and buying of scrap and surplus molding powders. Send complete resume and state salary requirements. All replies held in strict confidence.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.

CHEMICAL MARKET RESEARCH: Our expanding consulting service to the chemical process industries means we have openings for young chemists and/or chemical engineers who are looking ahead. No market research training is necessary but some industrial experience is indicated plus an active interest in the economic and marketing phases of the chemical process industries. Obviously training or experience in market research would be valuable. ROGER WILLIAMS, Technical & Economic Services, Inc., 148 East 38th Street, New York 16, New York. MUrray Hill 5-5257.

TOP NOTCH THERMOPLASTIC ENGINEER WANTED: The right man can practically write his own ticket if he shows results in the molding of thermoplastic parts. Here is the opportunity of a lifetime for a man well qualified in die design and injection molding. Remuneration commensurate with ability to produce. Must be willing to locate in the Detroit area. Kindly give education, experience, and expected salary in complete resume. All replies will be held confidential. If your letter convinces us you may be the man for the job, we will arrange an interview at our expense. Please send photo or snapshot. Reply Box 3059, Modern Plastics.

PRODUCT DEVELOPMENT ENGINEER
Excellent opportunity for man with technical degree, experienced in at least one of the following: molding compounds, vinyl resins, polyester resins, sheeting and film. Stimulating work with a future in the market development field for candidates with strong sales personalities, initiative and imagination. Please write complete details, including initial salary required. Reply Box 3014, Modern Plastics.

(*Continued on page 272*)

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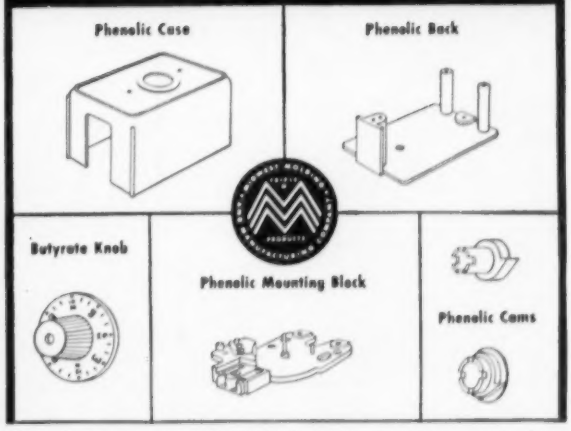
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Manufacturers of extruded, coated, foam plastics and... VINIDEC outstanding vinyl flooring!

CLASSIFIED ADVERTISING

(Continued from page 270)

PLANT SUPERINTENDENT WANTED
Capable of setting up and taking full charge of plastic extrusion division. Excellent opportunities with fast growing midwest firm. Furnish complete resume. Replies treated confidentially. Reply Box 3007, Modern Plastics.

PLASTICS SALESMAN: Well established manufacturer of molding compounds needs a college graduate with experience in sales or service of thermosetting molding compound. Must be willing to relocate. Reply Personnel Director, Box 3012, Modern Plastics.

PLASTICS CHEMISTS
1. Specialist in Methyl Methacrylate molding compounds. 2. Specialist in Nylon molding compounds. 3. Research chemist with a thorough knowledge of thermoplastic molding compounds.
Reply Box 3035, Modern Plastics

WANTED
Young, aggressive chemical engineer experienced in acrylic plastics, between ages of 25 to 35. Excellent opportunities. Replies treated confidentially. Reply Box 3006, Modern Plastics.

CHEMIST: Experience in Pressure Sensitive Adhesives and Release Papers. Well established Chicago Firm looking for continued expansion needs technical director. Complete authority reporting directly to President. Salary open commensurate with experience and ability. Write fully. Replies will be kept confidential. Reply Box 3019, Modern Plastics.

COME TO TEXAS
We have permanent opportunities galore for injection molding plant personnel—plant engineer, assistant plant superintendent, foremen, machine operators, maintenance men, set-up men. Inquire about foreman training program. Our employees know about this ad.
LOMA PLASTICS, INC.
P. O. Box 11277
Fort Worth, Texas

SALES MANAGER: Custom—Compression—Established eastern company offers exceptional opportunity to experienced man capable of own costings and thoroughly familiar with markets. Send complete resume and salary desired. All replies confidential. Reply Box 3024, Modern Plastics.

POLYMER CHEMIST WANTED
Experienced Polymer Chemist required for fast growing midwest firm. Excellent opportunities. Replies treated confidentially. Reply Box 3005, Modern Plastics.

PLASTICS SALES ENGINEER
Large established and well respected Chicago Injection Molding, Finishing and Extrusion Company seeks experienced man with industrial and packaging experience. Salary plus commission. Will be given active territorial accounts. All replies strictly confidential. Reply Box 3026, Modern Plastics.

WANTED: Engineer thoroughly experienced in all phases regarding the manufacture of vinyl wire inserted flexible hose. This is an excellent opportunity to work with a progressive company on either a consultant or permanent position basis. Submit full details. Reply Box 3030, Modern Plastics.

EXTRUSION SUPERVISOR
Thoroughly familiar with die design, set up, and running intricate shapes wanted by leading Eastern custom-extrusion house. Congenial working conditions. Company will help relocate right man. Enquiries will be treated in utmost confidence. Reply President, Box 3003, Modern Plastics.

ADHESIVES—CHEMIST: Chemist with experience or interest in adhesives or allied materials—rubber, resins, etc.—needed for adhesives research and development assignment by large national manufacturer located in Eastern Pennsylvania. Write giving age, salary, experience, etc., to Box 3032, Modern Plastics.

VINYL COLOR MATCHER
Man experienced in color matching and production color control in film and sheeting. Reply Box 3036, Modern Plastics.

CHEMIST OR CHEMICAL ENGINEER: Experienced in formulation and processing of vinyl organosols and plastisols for fabric coating. Practical factory experience in all phases of processing desirable. Give full particulars, including education, experience and salary requirements. Reply Box 3028, Modern Plastics.

VINYL CHEMIST
Manufacturer calendered film and vinyl sheeting requires experienced chemical engineer or chemist. All replies confidential. Reply Box 3034, Modern Plastics.

HELP WANTED
Largest Custom Extruder in East has completed expansion program and is now looking for Salesmen and Product Development Personnel in all phases of the extrusion business. Reply Box 3037, Modern Plastics.

ENGINEER, MECHANICAL: We are extruders of plastic products. Planned expansion requires services of a mechanical engineer with considerable experience in the mechanical techniques and equipment relative to all phases of plastic extrusion. Location N.J. near New York City. Please address letter of application with full particulars to Box 3053, Modern Plastics.

TECHNICIAN
Man with technical background in injection molding to assist sales force working in east and mid-west. Plant located in east and specializing in engineered plastic moldings. Excellent opportunity for qualified man. Salary open. Reply Box 3061, Modern Plastics.

EXTRUSION FOREMAN: Must have well rounded experience in blown tubing, and be capable of doing own set up and die adjustment work. Excellent opportunity in well established national concern in Southeastern area. Reply Box 3039, Modern Plastics.

FLOOR TILE CHEMIST
Experienced manufacture vinyl tile. Location, Midwest. Liberal insurance and pension plan. Reply Box 3035, Modern Plastics.

HELP WANTED
Maintenance engineer for plastic calenders, mills, banbury. Must be experienced. Reply Box 3029, Modern Plastics.

PLASTICS: Large extrusion firm needs top man for vinyl formulation work to augment staff. Experience required and full knowledge of raw materials essential. Should also be familiar with extrusion techniques and have good industry knowledge of new products and techniques. Located along Atlantic seaboard. Please give us complete resume of your experience for prompt consideration. Reply Box 3042, Modern Plastics.

PLASTIC ENGINEER
Must have extensive experience in INJECTION MOLDNG and able to completely engineer custom molding jobs from proper mold design through all tooling for finishing operations including spray painting, hot stamping and assembly. Should also be able to do part cost estimating, mold ordering and follow up. We will also consider a mold maker now on a bench or a heavily experienced mold designer whom we will train for this unusual opportunity for permanent association with expanding firm having a large new modern plant in the New York Metropolitan area. Reply Box 3054, Modern Plastics.

TECHNICAL CONTROL SUPERVISOR: Long-established midwest manufacturer vinyl and rubber coated fabrics for automotive, furniture and allied industries needs young man with plant and/or laboratory experience. Will be given responsibility technical control involving compounding and color specifications. Also quality control in certain phases production. Salary commensurate with background and ability. Excellent opportunity grow with aggressive firm. Send detailed resume to Box 3041, Modern Plastics.

POLYESTER CHEMIST: Excellent opportunity for man with heavy formulation and research experience in polyester field. For fast-growing chemical company who is expanding its polyester program. Age 35-45. Salary open. Eastern Area. Reply Box 3044, Modern Plastics.

SITUATIONS WANTED

REINFORCED PLASTICS CHEMIST with broad experience in all manufacturing methods available. Well acquainted with metallizing of plastics. Prefer Metropolitan New York area. Reply Box 3051, Modern Plastics.

DEVELOPMENT—PRODUCTION: Responsible position wanted where demonstrated ability will lead to executive level. Seven years sound, progressive experience: thermoplastic product and process development in wire and cable; development and production of injection molding powders; production of plywood adhesives. Solid background in practical polymer chemistry and knowledge of available materials. B.Ch.E., age 30, ambitious. Reply Box 3048, Modern Plastics.

RUBBER-VINYL CHEMIST: B.S., Graduate Chemist seeking broader opportunity; five years experience formulating and production vinyl plastisols, vinyl solution coatings, plasticizer, resin and stabilizer evaluation, polyester compounding and natural & synthetic rubbers; pilot plant operation, calendering & spread coating. Seeks position with reputable firm N. Y. Metropolitan Area. Reply Box 3009, Modern Plastics.

VACUUM FORMED DISPLAY SPECIALIST seeking opportunity to handle operation. Wide experience in pre-printing in distortion. Interested in setting up and running a vacuum forming department for a lithographer, display manufacturer or plastic firm to produce high grade third dimentional plastic displays and decorations. Reply Box 3052, Modern Plastics.

GENERAL MANAGER EXECUTIVE ENGINEER: Background of accomplishment in sales, engineering, management, and production, is available to run a medium-sized injection molding plant on a salary and a profit-sharing basis. Can aggressively develop sales and proprietary products and organize an efficient operation. Reply Box 3063, Modern Plastics.

SALES AGENTS WANTED

MANUFACTURERS' REPRESENTATIVES wanted by Eastern plastics extruder to sell vinyl and polyethylene extrusions on a commission basis in New England, upper New York State and Chicago areas. Other territories open. Reply giving present lines and territory wanted to Box 3046, Modern Plastics.

WANTED: Experienced, qualified sales agent for custom molded and extruded thermoplastics to operate from newly established branch plant in Jacksonville, Florida. Address FRANKLIN PLASTICS, INC., Franklin, Pennsylvania.

MANUFACTURERS' REPRESENTATIVES now calling on injection molders wanted by Eastern manufacturer of top quality regular and impact polystyrenes. Commission basis. Many territories open. Reply stating territory covered, lines now carried, experience. Reply Box 3008, Modern Plastics.

INDUSTRIAL REPRESENTATIVES
Large Midwest Molding, Finishing and Extrusion Plant has territories open in St. Louis, Grand Rapids and Minneapolis area for the right aggressive and experienced Industrial representation. Drawings against commission. Active accounts will be turned over. All replies strictly confidential. Reply Box 3027, Modern Plastics.

(Continued on page 273)

CLASSIFIED ADVERTISING

(Continued from page 272)

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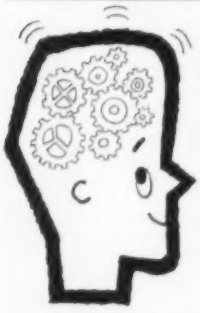
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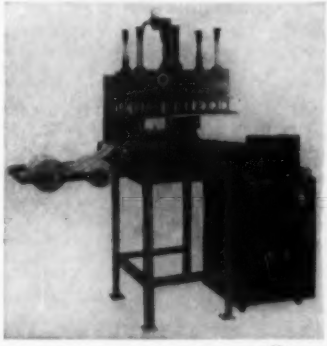
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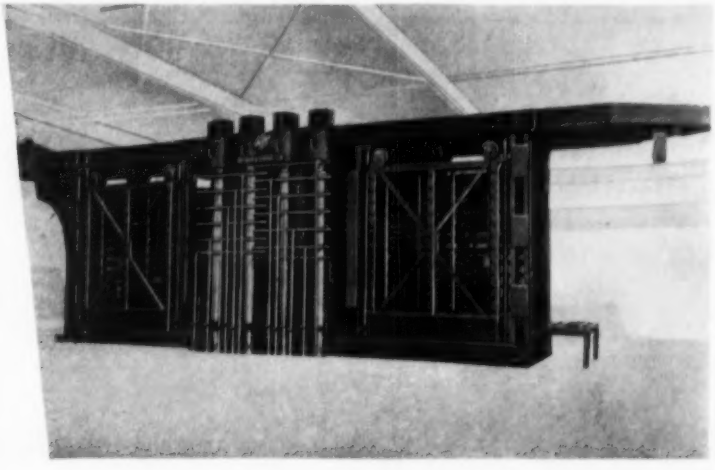


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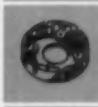
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